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ERRATA

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page 30 line 13 for 'bunt' read 'bent'
171 34 for 'manganese' read 'magnesium'
221 12 for 'of' read 'og'
324 1 for '*turgidospilum*' read '*turgidopilosum*'
461 14 for '488' read '458'
504 47 for '*Phyllacora*' read '*Phyllachora*'

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38 48 for '*lini*' read '*exigua*'
49 for '*exigua*' read '*lini*'
41 28 for '*C.*' read '*L.*'
60 9 for 'Sen Gupta (R.S.)' read 'Sen Gupta (S.R.)'
84 48 for 'Mescher' read 'Miescher'
101 5 for '291' read '29'
166 29 before 'bird cherry' insert 'plum'
30 for 'damson' read 'plum'
31 delete '[*larici-*]'
34 after '20, p. 72]' insert 'and redcurrant'
36 for 'bearberry (*Arbutus* [*Arctostaphylos*] *uva-ursi*)' read 'blackberry'
192 10 for '103' read '107'
217 47 for '27' read '26'
235 5 for 'ibid.' read '*R.A.M.*'
247 40 for '*C.*' read '*Cintractia*'
257 4 for 'ibid.' read '*R.A.M.*'
291 8 for 'tomato spotted wilt' read 'tobacco leaf curl'
371 44 for 'Brierly' read 'Brierley'
444 14 for 'p. 6' read 'p. 132'
450 53 for 'also' read 'not'
500 47 for '*tenella*' read '*tenellus*'
536 25 for 'Seguro' read 'Segura'
601 6 for '9' read '8'

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REVIEW OF APPLIED MYCOLOGY

VOL. XXX JANUARY 1951

CHONA (B. L.) & MUNJAL (R. L.). **Puccinia kuehnii (Krueg.) Butler on Sugarcane in India.**—*Curr. Sci.*, 19, 5, pp. 151–152, 2 figs., 1950.

The type specimen of *Puccinia kuehnii* [*R.A.M.*, 21, p. 472; 22, p. 453; 28, p. 142] is based on a collection made by E. J. Butler on *Saccharum spontaneum* in Burma in 1912 (Fungi and disease in plants, pp. 380–381, 1918). He stated that the material yielded only a few immature teleutospores, and none have been found elsewhere until recently, when they developed in profusion on severely infected Co. 475 sugar-cane leaves from Kopergaon, Ahmednagar, Bombay. An amplified description of the rust is therefore presented.

The uredospore dimensions of the Bombay specimen (27 to 35 by 20 to 25 μ) agree with those of other collections on various species of *Saccharum*. The uredospores germinate in water in about six hours at 20° to 25° C. and lose their viability after a month's storage at this temperature. The teleutospores are bicellular, clavate, borne on persistent stalks, 10 to 16 μ long, Sanford's brown with a chestnut-brown epispore, 30 to 57 (mostly 38 to 48) by 17 to 22 μ excluding stalks, the upper cell usually 18 to 22 and the lower 20 to 26 by 12 to 18 μ.

HUGHES (C. G.). **Downy mildew disease in North Queensland.**—*Proc. Conf. Qd Soc. Sug. Cane Tech., 1950*, pp. 237–242, 2 figs., 1950.

The paper contains a report of an outbreak of sugar-cane downy mildew (*Sclerospora sacchari*) at White Rock in the Hambledon area near Cairns, Queensland, which has been noted from another source [*R.A.M.*, 29, p. 332]. The symptoms and control of the disease are described. The reactions of 23 varieties are listed in an appendix, Badila seedling, Cato, Clark's seedling, Comus, Korpi, Orion, Pindar, P.O.J. 2725, Q. 20, Q. 44, and S. J. 4 [ibid., 26, p. 263] being classed as resistant and S.J. 2 as highly resistant.

GUYOT (A. L.). **Contribution à l'étude des cryptogames parasites du sud-est de la France.** [A contribution to the study of the parasitic fungi of south-eastern France.]—*Bull. Soc. mycol. Fr.*, 65, 3–4, pp. 97–120, 10 figs., 1950.

This annotated list, compiled in collaboration with M. MASSENOT and J. MONTÉGUT, is of microfungi collected in the south-east of France [cf. *R.A.M.*, 26, p. 216]. It includes *Amphisphaeria acicola* on *Juniperus oxycedrus*, and *Mytilidion decipiens* on *J. communis* from Montpellier. Three new species are described.

DENNIS (R. W. G.). **A revision of the British Hyaloscyphaceae, with notes on related European species.**—*Mycol. Pap., Commonw. mycol. Inst.*, 32, 97 pp., 104 figs., 1949. 15*s.* 0*d.*

The author adopts Nannfeldt's classification of the Hyaloscyphaceae [*R.A.M.*, 11, p. 606] and adds a new genus *Hyalotricha* for species intermediate in character between *Unguicularia* and *Hyalopeziza*. Fifteen genera, of which 13 are represented in the British Isles, and 92 species are fully described and keyed. Certain western

European species are included in the keys. Two new species and two new varieties are described, and 17 new combinations made.

An account of species which the author refers to the Trichoscyphelloideae is appended and includes *Trichoscyphella calycina* (Schum. ex Fr.) Nannf., saprophytic on dead branches of conifers, typically *Pinus sylvestris*, *T.* (or *Dasyscypha*) *willkommii* (Hartig) Nannf. [ibid., 29, p. 392], and three unnamed species (commonly referred to '*D. calycina*') for which it is difficult to find valid specific epithets.

Nehira (T.). **Taxonomic studies of the genus Aspergillus (6). Seven species Aspergilli in the Far East.**—*J. Jap. Bot.*, 25, 6, pp. 117–124, 1950. [Japanese.]

In this paper, which is a continuation of earlier studies published in 1936 and 1937, the author gives notes on the morphology and taxonomy of *Aspergillus caesiellus*, *A. clavatus*, *A. fumigatus* and its var. *magnus*, *A. itaconicus*, *A. nidulans*, *A. sydowi*, *A. versicolor*, and various species considered synonymous with them found in the Far East. The results of anti-bacterial tests are also given.

Lowy (B.). **Hysteriales of Iowa.**—*Proc. Iowa Acad. Sci.*, 56, pp. 147–157, 1 pl., 1 fig., 1949. [Received October, 1950.]

In this extension of Seaver's work (*Bull. Labs nat. Hist. Univ. Ia* 6, pp. 41–219, 1910) the author describes the characters and taxonomic position of the Hysteriales as a whole, and gives a key to and notes on the five genera of the Hysteriaceae and thirteen species known to occur in Iowa, some of which are new records for the State.

Bawden (F. C.) & Kassanis (B.). **Some effects of host-plant nutrition on the multiplication of viruses.**—*Ann. appl. Biol.*, 37, 2, pp. 215–228, 1950.

The amounts of tobacco mosaic virus [*R.A.M.*, 29, p. 403] present in systemically infected White Burley tobacco plants in pot experiments at Rothamsted Experiment Station varied greatly with the mineral nutrition of the plants and were related to the effects on plant growth. With plants grown in soil, additions of phosphorus produced the greatest increases in plant size, in virus concentration of expressed sap, and in total virus per plant; nitrogen increased plant growth and virus concentration in the sap only in the presence of phosphorus [cf. ibid., 20, p. 499; 21, p. 169]. Combined supplements of phosphorus and nitrogen doubled the virus concentration of sap and increased the total virus per plant by factors up to 40. Potassium usually increased plant size and total virus per plant, but slightly reduced the virus concentration of sap. From all plants only about one third of the virus contained in the leaves was present in the sap. It appears that virus production occurred at the expense of normal plant proteins, and the ratio of virus to other nitrogenous materials was highest in plants receiving a supplement of phosphorus but not of nitrogen.

The effects of host nutrition on the production of virus in inoculated leaves were similar to those in systemically infected leaves, though they were more variable. Host nutrition had no consistent effect on the intrinsic infectivity of tobacco mosaic virus.

The concentration of virus in sap from Majestic potato plants systemically infected with an avirulent strain of potato virus X or with X^y and Doon Star with X^y was not consistently affected by fertilizers, the chief effect on virus production being indirect by altering plant size.

Lashbrook (R. V.) & Loring (H. S.). **Radioactive Tobacco mosaic virus.**—Abs. in *Fed. Proc. Amer. Soc. exp. Biol.*, 9, 1, p. 194, 1950.

At Stanford University, California, several methods were studied for the incorporation of radio-active phosphorus (P^{32}) into tobacco mosaic virus in

Turkish tobacco plants [*R.A.M.*, 22, p. 44]. The most highly radio-active virus was obtained when normal plants were allowed to take up the P^{32} phosphate as completely as possible from small volumes of distilled water and were grown in nutrient medium for a fortnight or so after inoculation. When radio-active virus was inoculated into growing leaves, the recovered virus had the same radio-activity as the inoculum, but 24 hours later the amount recovered was only 10 to 20 per cent. of the original. In these cases over 50 per cent. of the radio-activity was found in the supernatants after ultracentrifugation.

The results of the several types of experiments performed indicate that (*a*) there is little or no exchange of P^{32} between virus and host; (*b*) virus becomes associated with insoluble plant components, such as chloroplasts, after inoculation; and (*c*) during virus multiplication the original virus phosphate is largely converted to a non-virus form.

Bremer (H.) & Özkan (M.). **Domates bitkilerinde solgunluk hastalıkları.** [Tomato wilt diseases.]—*Mahsul Hekimi* (*Plant Prot. J.*), 3, 5, pp. 108–111, 1950. [English summary.]

Tomato wilt, caused by a *Fusarium*, presumably *F.* [*bulbigenum* var.] *lycopersici*, causes damage in parts of western Anatolia, where correct rotation is not practised. The pathogen was probably introduced from America with tomato seed. Control measures are indicated. Bacterial wilt (*Aplanobacter* [*Corynebacterium*] *michiganense*) [C.M.I. map No. 26] was observed on tomatoes in central Anatolia for the first time.

Ciccarone (A.) & Mezzetti (A.). **La 'picchiettatura batterica del Pomodoro' in Italia.** ['Bacterial speck of Tomato' in Italy.]—*Notiz. Malatt. Piante, 1950*, 10, p. 33, 1950. [Mimeographed.]

During July, 1949, tomatoes growing at Mola di Bari, Italy, were widely affected by a fruit-spotting. Inoculations of healthy tomato fruits with a bacterium isolated from infected material gave rise to typical symptoms. The condition was identified from the symptoms in natural and experimental inoculations and from the characters of the causal organism as bacterial speck (*Pseudomonas punctulans*) [*R.A.M.*, 28, p. 599], not previously recorded in Italy.

Andeweg (J. M.). **Veredelingsdoeleinden en -resultaten bij de Tomaat.** [Aims and results of improvement of the Tomato.]—*Meded. Direct. Tuinb., Wageningen*, 12, 8, pp. 506–515, 1949. [English summary.]

One of the objects of tomato breeding is the development of resistance to diseases, of which the most important from the Dutch grower's standpoint is leaf mould (*Cladosporium fulvum*) [*R.A.M.*, 29, p. 631]. The hopeful prospects of combining high productivity with resistance to disease offered by heterosis, a feature of the F_1 progeny of several crosses, are briefly discussed.

McKay (R.). **A physiological breakdown in Tomatoes caused by high temperatures in 1949.**—*J.R. hort. Soc.*, 75, 7, pp. 288–291, 1950.

During July, 1949, tomatoes in different parts of Eire developed large, glossy, blackish areas mainly in the equatorial region of green and partially ripe fruits, chiefly on the lowermost or exposed trusses. The lesions resembled those caused by *Phytophthora infestans*, but discoloration was more severe and the black patches more glossy. Internally the blackish regions were necrotic, but the necrosis seldom extended to the surface. No organism was isolated.

The disorder is thought to be due to exceptionally hot weather in the area during the period 18th June to 13th July when temperatures were 83° to 87° F. in the

shade, and it is regarded as a very severe manifestation of blotchy ripening [cf. *R.A.M.*, 23, p. 502; 29, p. 178].

WALLIHAN (E. F.). **Plantations of northern hardwoods. Some factors influencing their success.**—*Bull. Cornell agric. Exp. Sta.* 853, 31 pp., 23 figs., 1 graph, 1 map, 1949. [Received July 1950.]

In a study of frost damage (pp. 17–20) to hardwood planting stocks grown from seed collected in the vicinity of Ithaca, New York, it was found in 1946 that plantations derived from these seeds and located in parts of the State where the last killing frost occurred after 14th May, suffered extensive damage. The last killing frost at Ithaca occurred on 4th May, which suggests that there may be a tolerance of a week or ten days if susceptibility to frosts is regarded as a hereditary character. Thus the date of late spring frosts at the seed source should be a guide to the plantation site.

POMERLEAU (R.). **Les maladies dans la forêt québecoise en 1949.** [Diseases in the forests of Quebec in 1949.]—Conférence prononcée au 2e Congrès provincial de l'Association forestière québecoise le 5 octobre 1949, 11 pp., [? 1949. Received May, 1950.]

After stressing the vital need for conserving the natural timber resources of Quebec, the author reviews the damage caused by various parasites during the past ten years in Quebec forests and surveys current conditions there. White pine blister rust [*Cronartium ribicola*: *R.A.M.*, 19, p. 506; 28, p. 258] and more especially Dutch elm disease [*Ceratostomella ulmi*: ibid., 29, p. 542] are taking their toll of trees, as are various other endemic diseases. He discusses the source of Dutch elm disease and urges further research on the control of forest tree diseases.

BRICHET (J.). **La protection des arbres contre les violences solaires.** [Protecting trees from the sun's violence.]—*Fruits & Primeurs*, 20, 215, pp. 204–206, 3 figs., 1950.

Experiments carried out in North Africa during the past few years for the prevention of sun injury to trees have demonstrated the efficiency of coating the trunks and branches with a mixture consisting of 25 kg. hydrated lime, 2 kg. of powdered commercial zinc sulphate, and 300 g. of a commercial adhesive, to 400 l. water if it is to be applied as a spray or 200 l. if brushed on.

URAZ (E.). **Kestane mürekkep hastalığı Phytophthora cambivora.** [Chestnut ink disease (*Phytophthora cambivora*).]—*Mahsul Hekimi* (*Plant Prot. J.*), 3, 5, p. 116, 1950. [French summary.]

Chestnut trees growing at Boursa (or Bursa), Turkey, are affected by ink disease (*Phytophthora cambivora*) [C.M.I. map No. 70].

LANZA (FELICE). **Sulla conservazione delle Castagne destinate all'esportazione. Nota II. Ricerche sperimentali di lotta contro le infezioni crittogamiche (disinfezione chimica). L'ossido di etilene ed il bromuro di metile come fungicidi.** [On the preservation of Chestnuts destined for export. Note II. Experimental researches on the control of cryptogamic infections (chemical disinfection). Ethylene oxide and methyl bromide as fungicides.]—*Ann. Sper. agr.*, N.S., 4, 2, pp. 321–328, 1950. [English summary.]

A small consignment of chestnuts sent from Italy to the United States after treatment with methyl bromide having shown reduced mould infection [unspecified] on arrival, the author exposed young cultures of *Aspergillus niger*, *Fusarium roseum* [*Gibberella zeae*], *Trichoderma lignorum* [*T. viride*], *Penicillium 'crustaceum'* and *Actinomyces* spp. to pure ethylene oxide, the same mixed with carbon

dioxide, and to methyl bromide, using the same concentrations, temperature, relative humidity, and length of exposure as Whelton *et al.* [*R.A.M.*, 25, p. 509], but without any effect. When much higher concentrations (4 per cent. ethylene oxide at 70 gm. per cu. m. and 2 per cent. methyl bromide at 90 gm. per cu. m.) were used positive results were obtained, both on the pure cultures and on chestnuts showing moulding by various fungi, including *P. crustaceum*, *Sclerotinia pseudotuberosa*, *Phoma endogena* [ibid., 29, p. 483], and others. Experimental evidence also demonstrated that both gases gave effective control of fungi when used at the same concentrations as for insecticidal purposes, but with longer exposure.

DARPOUX (H.). **Le chancre du Châtaignier causé par l'"Endothia parasitica'.** [Chestnut canker caused by *Endothia parasitica*.]—*Docum. phytosan. Inst. Rech. agron., Paris*, 7, 24 pp., 4 pl., 9 figs., 1 diag., 2 maps, 1949. [Received July, 1950.]

The results of this survey of the distribution of chestnut canker (*Endothia parasitica*) have already been noticed from another source [*R.A.M.*, 29, p. 182]. Although this parasite has not yet been identified in France, it may already be present in wilted trees believed to be affected by other disorders, especially as the disease was not recognized in Italy until about twenty years after its introduction.

JOHANNES (H.). **Ein Pappelsterben, hervorgerufen durch den Pilz Septogloeum populiperdum sp.n.** [A dying-off of the Poplar caused by the fungus *Septogloeum populiperdum* n.sp.]—*NachrBl. dtsch. PflSchDienst* (*Braunschw.*), 2, 5, pp. 67–69, 3 figs., 1950.

Two phases are distinguishable in the symptomatology of a poplar disease lately observed in the Helmstedt district of Brunswick and hitherto unknown in Germany. To begin with, the leaves of the one-year-old shoots and spring-planted cuttings turn pale and assume a glassy-transparent aspect. The areas involved are delimited by the main and secondary veins, in immediate proximity to which the normal rich green colour is retained. Two to three weeks later the entire margin rolls upwards, imparting a distinctive cupulate appearance to the leaves. During and after damp weather white pustules, 1 mm. in diameter, the conidial stromata of the causal organism, develop on both leaf surfaces. The leaves of diseased trees are shed sooner than those of healthy ones. In the following spring the disease enters on its second phase, characterized by the sudden cessation of growth and subsequent desiccation of the apparently normal buds. Closer inspection reveals the detachment of the cortex from the infected shoots, beginning at the last pruning cuts and progressing towards the tip. The cambium is discoloured black and totally disorganized.

A species of *Septogloeum*, unlike those hitherto recorded on the same host, was consistently isolated from diseased leaves and is named *S. populiperdum* n.sp., a fuller description being reserved for publication in *Phytopath. Z.* The thin-walled, hyaline, tri- to pluricellular conidia measure 32·6 to 43·5 by 6·4 to 8·2 μ. The disease has been observed since 1947 on *Populus vernirubens*, *P. bachelierii* [*P. angulata*], *P. generosa*, the 'red' (as opposed to the 'green') form of *P. robusta*, *P. candicans* (slight infection), and *P. serotina* (isolated instances only). In August, 1948, the area covered by the disease measured 150 sq. m., as compared with 10 to 15 on its first appearance in the previous summer, and the resultant losses of parent stocks and cuttings were estimated at 500 and 10,000 to 15,000, respectively At the beginning of the winter of 1948–9, cuttings were taken from the remainder of the apparently healthy material and layered in sand. On inspection at planting time the cortex was peeling off and the cambium blackened in a large proportion of the cuttings, while only 10 to 20 per cent. of the others gave rise to normal shoots. Further spread of the disease in 1949 was checked by four applications during the

growing period of 2 per cent. copper-lime (Wacker), combined with the destruction of all infected and doubtful stocks and the renewal of the sand used for layering.

A severe outbreak of the new disease was also reported from Ultze (Hanover), covering 40 per cent. of the propagation bed and affecting mainly *P. deltoides*.

HUTCHINSON (P. B.). **A bacterial disease of Dysoxylum spectabile caused by the pathogen Pseudomonas dysoxyli n.sp.**—*N.Z.J.Sci. Tech.*, B, 30, 5, pp. 274–286, 7 figs., 1 graph, 1 map, 1949.

Dysoxylum spectabile, growing in the coastal areas of North Island, New Zealand, and the extreme north-east of South Island is affected by a disease attacking the leaves and stems. On the leaves circular sharply defined, greasy spots, up to 10 mm. in diameter develop, visible both dorsally and ventrally. These develop into hard, greyish-brown to black, dry, corky areas which finally drop out. Oval lesions often measuring 50 by 6 mm. may also occur on the smaller branches and leaf petioles. In a survey of over 1,000 trees from North Auckland to Marlborough the disease was found throughout. Of the mature trees over 99 per cent. were affected.

Infected material showed the presence of a bacterium 0·6 by 0·4 to 1 by 0·6, average 0·8 by 0·5 μ, Gram-negative, motile by a single polar flagellum or occasionally two flagella. On beef-peptone-agar the colonies were grey and translucent, smooth, entire to undulate, and the medium was stained brown after one week. The name *Pseudomonas dysoxyli* n.sp. is proposed.

Pathogenicity tests under forest conditions on *D. spectabile* plants ranging from seedlings to trees 40 ft. tall were positive in all cases. Glasshouse and field experiments indicated that transmission is normally affected by contact between diseased and healthy leaves and by transference of the organism in water droplets. Birds or insects may also, possibly, serve as vectors.

PEACE (T. R.) & LOUGHBOROUGH (H. L.). **Dying of groups of Sitka Spruce.**—*J. For. Comm., 1949*, 20, pp. 201–202, 1949.

Dying of Sitka spruce [*Picea sitchensis*] in groups on a wide range of sites in Great Britain [*R.A.M.*, 29, p. 541] appears to be associated with root damage. No mycelium was found between the dead bark and the wood, but after the bark had been stripped the surface of the wood showed a water-soaked appearance. Dying spruces were observed in 1936 at Canonbie, Dumfriesshire, in 1939 at Thirlmere, and in 1945 at Kerry. By 1945 the area at Canonbie had been felled and the patches at Thirlmere had increased in size and number. The progress of the disease is being studied in plots at Thirlmere, Forest of Dean, Dunster, and Longleat. Dying of Norway spruce [*P. abies*: loc. cit.], also from an unknown cause, has also been reported from Patching, Sussex, and near Stafford. In this case the top of the trees dies before any of the major roots.

RENNERFELT (E.). **Investigations of thujaplicin, a fungicidal substance in the heartwood of Thuja plicata D. Don.**—*Physiol. Plant.*, 1, pp. 245–254, 2 graphs, 1948. [Received September, 1950.]

A tabulated account is given of experiments carried out at the Forest Research Institute, Stockholm, to determine the effect of three isomeric compounds, α-, β-, and γ-thujaplicin [*R.A.M.*, 29, p. 592], with the empiric formula $C_{12}H_{12}O_2$, isolated from western red cedar (*Thuja plicata*) heartwood, on malt extract agar cultures of decay and blueing fungi. At 0·0005 per cent., γ-thujaplicin inhibited the growth of *Merulius lacrymans*, at 0·001 per cent. *Coniophora puteana*, and at 0·002 per cent. *Fomes pinicola*, *Poria asiatica*, and *P. vaporaria*. From comparative tests with phenol and sodium pentachlorophenol and from other data it is concluded that γ-thujaplicin is roughly 100 to 200 times more efficient than phenol and 10 times

more so than pinosylvin in the control of wood-rotting fungi, and virtually on a par in this respect with sodium pentachlorophenol.

In tests with *Cladosporium herbarum*, *Ophiostoma* [*Ceratostomella*] *piceae*, *O.* [*C.*] *pini*, *Phialophora fastigiata*, *Phoma lignicola*, *Pullularia pullulans*, and other fungi γ-thujaplicin was very toxic; growth of all species was completely inhibited at 0·02 per cent., *C. piceae*, *Phialophora fastigiata*, and *Phoma lignicola* at 0·01 per cent., and *Pullularia pullulans* at 0·005 per cent. and even at 0·001 per cent. some of the fungi did not grow so well as the controls. It was ten times more effective against these fungi than phenol but was less toxic than sodium pentachlorophenol which considerably inhibited their growth at 0·002 to 0·005 per cent.

In comparative tests of α-, β-, and γ-thujaplicin with *P. pullulans*, by the agar diffusion method, β-thujaplicin was the most toxic, and γ-thujaplicin was more toxic than α-thujaplicin. If the zone lacking pigment formation is included in the inhibition area then β-thujaplicin and sodium pentachlorophenol are almost equally effective.

In a further test with *P. pullulans* to determine whether the action of γ-thujaplicin is fungistatic or fungicidal, after three hours' treatment the number of colonies developing in the dishes containing γ-thujaplicin was 9 per cent. of that in the controls, and after six hours no colonies developed. In a similar test with sodium pentachlorophenol a comparable effect was achieved in one hour. Thus, γ-thujaplicin is able to destroy the spores of *P. pullulans* in a relatively short time, though not so rapidly as sodium pentachlorophenol.

Bryan (J.) & Richardson (N. A.). **Experiments on the preservation of mine timber.**—*For. Prod. Res. Rec., Lond.*, 3, 9 pp., 3 pl., 2 graphs, 1949. 6*d.*

This is a revised edition of a previous bulletin [*R.A.M.*, 15, p. 186] on treated mine timber [ibid., 29, p. 592] and gives the results up to 1947. Inspections were made half-yearly up to 1934 and thereafter annually until 1940, a final inspection being made in 1947. From curves plotted to show the approximate rate of decay, based on a scale of 1 (badly decayed) to 3 (sound), it appeared that at Woolmet pit, Edinburgh, after 10 years (in 1939) props treated with zinc chloride or Wolman salts were approximately 97 per cent. sound, the corresponding figure for sodium fluoride being 92, for sodium chloride 56, and the original untreated group 0. At Langton, Nottingham, creosote-treated timber was 100 per cent. sound, that treated with Wolman salts 92, sodium fluoride 88, zinc chloride 77, sodium chloride 50, and untreated 9. In 1947 the numbers (out of 50) of sound Scots pine props from Norway at Woolmet and Langton, respectively, were: for 5 per cent. Wolman salts 22 and 15; 2 per cent. 19 and 28; 5 per cent. zinc chloride 26 and 16; 2 per cent. 16 and 5; 4 per cent. sodium fluoride 25 and 19; 2 per cent. 28 and 18; 10 and 8 per cent. sodium chloride 2 and 3; 5 and $3\frac{1}{2}$ per cent. 4 and 2. The figures for home-grown timber were rather less. Timber treated with coal tar creosote at Langton has not decayed after 16 years.

Gould (C. J.). **Vegetable seed-treatment in Western Washington.**—*Bull. Wash. St. agric. Exp. Sta.* 510, 45 pp., 4 figs., 1949.

The results [which are fully tabulated] of seed treatment tests from 1942 to 1946 of 19 vegetable crops [*R.A.M.*, 28, p. 150] in western Washington have shown that only kale and celery failed to repond with increases in stand. Seed treatment is regarded, therefore, as an economic proposition. The value of the treatment was primarily that of seed protection against *Fusarium* spp., *Rhizoctonia* spp., and various unidentified Phycomycetes. It is probable that the results would apply to other parts of the State. Arasan injury to lettuce seed was not observed even with the maximum concentration. Also tabulated are the assessments of the value of various materials for different crops, the results with materials

used at maximum concentrations, manufacturers' recommendations for the crops, and details of the materials used.

WILSON (J. D.). **Controlling diseases of vegetable crops with organic fungicides.**—*Agric. Chemicals*, 5, 7, pp. 32–33, 1950.

The author briefly reviews and discusses the results obtained in the United States in recent years from the use of organic fungicides for the control of vegetable diseases [see preceding abstract]. Copper 8-quinolinolate [*R.A.M.*, 28, p. 182; 29, p. 84] gives satisfactory control of tomato anthracnose [*Colletotrichum phomoides*: ibid., 29, pp. 63, 339, 439], but the price is prohibitive.

BUHL (C.). **Eine Viruskrankheit des Kopfkohls (Brassica oleracea L.)? (Vorläufige Mitteilung).** [A virus disease of Head Cabbage (Brassica oleracea L.)? (Preliminary note).]—*NachrBl. dtsch. PflSchDienst* (*Braunschw.*), 2, 4, pp. 53–54, 2 figs., 1950.

Since about 1945 a disease of cabbage, principally affecting the late white, red, and Savoy crops, has been on the increase in the Dithmarsch region of Schleswig-Holstein and is causing much concern among local growers. The inception of heart formation, from the end of August onwards, is accompanied by a typical yellow sectoring of the oldest leaves, spreading from the tips or margins, and often irregularly sprinkled with *Alternaria* spots. Red cabbages frequently display a conspicuous light red coloration. Four to six weeks after the onset of the disease a marked browning develops in the damaged sectors, followed by shrivelling. The stands acquire a 'variegated' aspect and premature defoliation ensues, leaving only a scanty head on a long stem, surrounded by the desiccated fallen leaves.

Sections through diseased hearts, especially of the white varieties, reveal hard, dry, black, necrotic spots and specks on the inner leaves, often only on a single layer. The younger, still green bracteal and wrapper leaves show extensive mottling and clearing, as described by Moerike and Winter in connexion with a cauliflower virus disease [*R.A.M.*, 19, p. 508]. Affected plants may be detected at an early stage by the absence of the blue-green wax coating characteristic of healthy leaves.

Yield reductions due to premature shedding of the outer leaf whorls have ranged of late years from 25 to 30 per cent. Keeping quality is also impaired, since the necrotic spots in the inner part of the heart frequently afford ingress to secondary bacterial and fungal rots.

Symptoms resembling the foregoing have also been observed on other kinds of brassicas, including kale and Brussels sprouts, and in a milder form on late cauliflower, and they are particularly noticeable on swedes. Pape [ibid., 29, p. 449] has shown that on the last-named host the agent of the disease is a virus, but in the case of cabbage no definite conclusion as to etiology has yet been reached. The role of the *Alternaria* appears to be purely secondary, and no evidence for the intervention of physiological factors is forthcoming. In all probability the virus attacking swedes is likewise responsible for the cabbage disease, which is specially severe in proximity to stands of [cabbage] seed-bearers, rape, and more particularly swedes. The most likely local vectors are *Lygus pratensis* and *Brachycolus brassicae*.

PLANT (W.). **The control of whiptail in Broccoli and Cauliflower.**—*J. Minist. Agric.*, 57, 3, pp. 130–134, 1950.

In this account of symptoms, diagnosis, and experiments on control of whiptail [molybdenum deficiency] in cauliflower and broccoli [*R.A.M.*, 29, p. 393] further reports of the disorder come from Derbyshire, Leicestershire, East Sussex, Wiltshire, Brecon, Caernarvon, Glamorgan, and Pembroke. It occurs mostly on various types of acid soil. The cauliflower varieties Majestic, Novo, and Veitch's Autumn

Giant, and the broccoli varieties Early Feltham, Satisfaction, St. George, and Roscoff types have all shown typical whiptail symptoms. Molybdenum deficiency [see next abstract] is affected by climate, and drought periods accentuate the extent of symptoms. Wherever possible liming should be the corrective measure, and when carried out during a crop rotation should be applied to the preceding crop. If whiptail has not disappeared after the soil pH has been raised to neutrality, sodium molybdate [loc. cit.] should be applied.

Morgan (C. N.) & Henderson (A. F. C.). **Whiptail in Cauliflowers.** —*Qd agric. J.*, 70, 6, pp. 338–341, 1 fig., 1950.

A description is given of the symptoms of cauliflower whiptail [molybdenum deficiency: *R.A.M.*, 23, p. 39], which occurs in most of the intensively farmed market gardens in southern Queensland, together with varietal susceptibility, trace elements and soil reaction in relation to the disorder, and control by means of ammonium molybdate [ibid., 28, p. 369, and preceding abstract].

Blattný (C.) & Perlhefter (K.). **Bor a srdečková hniloba Řepy krmné.** [Boron and heart rot of fodder Beet.]—*Ochr. Rost.*, 19–20, 10–11, pp. 26–28, 1947. [Russian summary. Received July, 1950.]

Fodder beets growing on alluvial, acid soils in southern Bohemia, Czechoslovakia, develop severe heart and dry rot due to extreme boron deficiency [*R.A.M.*, 22, p. 90; 28, p. 590]. Experiments conducted during 1943–45 demonstrated that borax applications (15 kg. per ha.) completely eliminated the trouble, which affected 61 to 100 per cent. of the crop. The yields from treated plots were increased by 35 to 160 per cent. The weight of roots from untreated plots even if they showed no symptoms was about one fifth lower than that from treated, and their storage life about one month shorter. Opium poppies interplanted with beet also suffered from boron deficiency, the seed yields being reduced in some cases by one quarter.

It is recommended that the boron content of soils be examined to determine their suitability for fodder beet and sugar beet production, and their reactions to boron treatment. Fertilizers used for beet and poppy in deficient soils should contain boron. It is suggested that certain celery rots, regularly accompanied by *Phoma apiicola* [ibid., 28, p. 436], may also be due to boron deficiency.

Goffart (H.). **Beobachtungen über einige Krankheiten und Schädlinge der Zuckerrübe in der Türkei.** [Observations on some diseases and pests of the Sugar Beet in Turkey.] —*NachrBl. dtsch. PflSchDienst (Braunschw.)*, 2, 4, pp. 60–61, 1 fig., 1950.

The most important beet disease encountered by the author during a visit to Anatolia and Thrace, Turkey, from June to August, 1949, was the leaf spot caused by *Cercospora beticola* [*R.A.M.*, 27, p. 350]. Crown gall [*Bacterium tumefaciens*: ibid., 26, p. 531] and mildew (*Microsphaerella* [*Microsphaera*] *betae* [ibid., 19, p. 187]) are widespread but of little significance, and the only virus disease observed was mosaic. Heart rot and dry rot [boron deficiency] were present in 30 per cent. of the plants in one of the Thracian fields inspected.

Teshitch (Z. P.). Један редак варијетет фитопатогених вактерија код нас. **Bacterium phaseoli var. fuscans (Burkh.) Burgw. 1930.** [A rare variety of phytopathological bacterium in our country—*Bacterium phaseoli* var. *fuscans* (Burkh.) Burgw. 1930.]—*Annu. Fac. agron. Belgrade*, 2, pp. 103–115, 1949. [Russian and French summaries.]

In July, 1948, the author isolated *Bacterium* [*Xanthomonas*] *phaseoli* var. *fuscans* [*R.A.M.*, 27, p. 510] from spots on haricot bean [*Phaseolus vulgaris*] pods, originating from the Experimental Gardens of the Faculty of Agriculture, Belgrade.

This is the first record of this variety in Yugoslavia. Details of the properties of the bacterium, as ascertained by the author, are given. The production of the brown pigment (melanin) is considered to be a fermentation reaction. Melanin is produced more rapidly when peptone is present in the culture medium than in meat broth or milk.

Gilman (J. C.) & Tiffany (Lois H.). **The McCormick effect in cultures of Diaporthe phaseolorum var. batatatis from Soybeans.**—*Proc. Iowa Acad. Sci.*, 56, pp. 129–131, 1 fig., 1949. [Received October, 1950.]

In certain plate cultures of *Diaporthe phaseolorum* var. *batatatis* [*R.A.M.*, 28, p. 106] that had become contaminated with colonies of *Alternaria tenuis*, the perithecia were produced around the periphery of the contaminating colony before appearing in any other part of the plate. They were normal in every respect and produced normal ascospores. The phenomenon is considered to be similar to that observed by Heald and Pool with *Melanospora pampeana* (*Rep. Neb. agric. Exp. Sta.*, 22, pp. 130–132, 1909) and later worked out by McCormick [*R.A.M.*, 5, p. 392]. The results of previous work [ibid., 28, p. 318] indicate that *D. phaseolorum* var. *batatatis* is very dependent on its substratum for the nutritional elements necessary for fruiting.

Smolák (J.). **Kokotice rolní přenašečem viru.** [Dodder vector of a virus.]—*Ochr. Rost.*, 22, 1–2, pp. 55–58, 2 pl., 1949. [Russian and English summaries. Received July, 1950.]

In the summer of 1948 the author found in a kitchen garden in the western suburbs of Prague dodder (*Cuscuta arvensis*) thriving on carrot plants, which were at the same time infected with [aster] yellows virus [*R.A.M.*, 29, p. 193]. Beds where the parasite was absent were healthy. It is suggested that *C. arvensis* had transmitted the virus.

Volcani (Zafrira). **A disease on green Sweet Pepper fruits caused by Bacillus polymyxa.**—*Palest. J. Bot.*, R. Ser., 7, 1–2, pp. 142–155, 1 pl., 1949. [Hebrew summary. Received August, 1950.]

The spore-forming bacterium, *Bacillus polymyxa*, detected in Palestine during August and September, 1947, as the agent of spotting on green sweet pepper fruits (*Capsicum annuum*) [*R.A.M.*, 27, p. 458] is fully described. It may also cause lesions which appear as dry, light brown sunken spots surrounded by the same dark brown network of vessels as in the type of lesion previously described [loc. cit.]. In all cases the epicarp as well as the endocarp of the fruits was affected.

A strain of the bacterium was found to be pathogenic to attached and detached green tomato fruits, potato tubers, and slices of potato, egg-plant, radish, onion, and carrot under laboratory conditions with temperatures ranging from 30° to 37° C. The paper concludes with an account of spore-forming bacteria as plant pathogens.

Malaguti (G.) & Pontis V[idela] (R. E.). **El 'tizón' o 'mildew' del Pimiento en Venezuela.** ['Blight' or 'mildew' of Pimento Pepper in Venezuela.]—*Agric. venez.*, 14, 141, pp. 4–5, 2 figs., 1950.

Phytophthora capsici was observed on chillis [*R.A.M.*, 27, p. 204 *et passim*] for the first time in Venezuela in February, 1949, and is at present known to occur in the States of Aragua, Miranda, Carabobo, and Táchira. The disease assumes two forms according to the time of year, namely, collar and root rot in the dry summer season, and blight (which may cause total failure of the crop) under the humid conditions prevailing in the winter. The seedlings should be transplanted during the summer into the centre of furrows 1 to 1·2 m. wide and ridged so that the

irrigation water does not come into direct contact with the roots. The results of experiments in large plantings showed a reduction of 90 per cent. in the incidence of infection where this practice was followed. In regions where the disease is endemic disinfection of nursery soils is essential and only healthy seedlings should be transplanted. Spraying infected seedlings with 0·5 per cent. Bordeaux mixture has given good results.

Ciccarone (A.). **Marciume dei frutti di Arachide dovuto a Thielaviopsis basicola (Berk.) Ferr.** [Rotting of Groundnut pods due to *Thielaviopsis basicola* (Berk.) Ferr.]—Reprinted from *Ital. agric.*, 86, 12, 3 pp., 3 figs., 1949. [Received May, 1950.]

During 1948 groundnuts from several areas round Vibo Valentia were rendered unsaleable by a disease of an epidemic nature which was caused by a fungus determined on the basis of the macro- and microscopic characters as *Thielaviopsis basicola* [*R.A.M.*, 17, p. 298]. It produced black or fuliginous spots becoming irregularly confluent and involving one half of the shell or more. The interior of the pods and the surface of the seeds were similarly affected. The cotyledons adhered to the seed coat and became covered with a thin black crust, especially between each seed. The exterior of the shells finally became covered with a white powder due to a species of *Fusarium* which invaded the interior causing the seeds to germinate prematurely or become rotten. In 1949 the disease had spread to other areas, chiefly Parghelia.

Infected seeds treated with mercuric chloride (1 : 1,000 for two minutes at first), washed, and sown on Czapek agar plates did not support growth by *T. basicola* although *Fusarium* developed according to the extent of decay. The avoidance of wet soil and high relative humidity may be of use in preventing this type of rot.

A[tkins] (F. C.). **A Mushroom bed competitor.**—*Bull. Mushroom Grs' Ass.* 19, p. 76, 2 figs., 1950.

A dense white vegetative growth of a mould found overgrowing a mushroom compost [in England] has been provisionally ascribed to *Corticium centrifugum* [*R.A.M.*, 23, p. 315].

Atkins (P. C.). **Building a modern Mushroom house.**—*Bull. Mushroom Grs' Ass.* 19, pp. 79–82, 3 figs., 1950.

Details are given of the construction of the new, electrically heated cropping houses being erected at Yaxley, Peterborough, to enable the synthetic compost developed by the Mushroom Research Association [*R.A.M.*, 29, p. 196] to be used on a commercial scale.

Sinden (J. W.). **Geotrichum control.**—*Bull. Mushroom Grs' Ass.* 20, p. 199, 1950.

Calcium hypochlorite dust is considered a satisfactory substitute for sodium hypochlorite [*R.A.M.*, 29, p. 195] in the control of *Sporendonema* (*Geotrichum*) [ibid., 29, p. 493] disease of mushrooms. It should be diluted with clay or talc and sprinkled dry directly on the patch of mould.

Un nouveau remède contre les maladies de la Vigne. [A new remedy for Vine diseases.]—*Fruits & Primeurs*, 20, 215, p. 208, 1950.

This is an extract from an article in *Campo*, May, 1950, which announced the discovery, after several years of exhaustive researches by E. G. Vasquez and A. P. Rodriguez, of a new material for use against vine mildew (*Peronospora* [*Plasmopara*] *viticola*). It consists primarily of the sap of a plant [unspecified] growing abundantly in Spain, 625 g. of which provides 10 l. of solution sufficient for treating 100 vines either as a prophylactic for those severely affected or to

immunize healthy plants. This product has been tested with marked success in vineyards in the provinces of Cadiz, Huelva, Malaga, and Ciudad Real.

Milisavljević (D.). **Ispitivanje dužine inkubacionog perioda Plasmopara viticola (B. et C.) Berlese et De Toni.** [Investigations into the length of the incubation period of *Plasmopara viticola* (B. & C.) Berlese & De Toni.]—*Trav. Inst. Rech. sci. agron., Belgrade*, 1, pp. 175–198, 1 graph, 1949. [French summary.]

Experiments were carried out over a period of years at the Research Institute for Viticulture and Arboriculture, Yugoslavia, in which vine leaves were artificially infected with spore suspensions of *Plasmopara viticola* [*R.A.M.*, 27, pp. 62, 311; 29, p. 197]. After 84 hours pieces of the infected leaves were placed for one night in a humidity chamber either in the laboratory or in the vineyard and the following day examined for the presence of conidia. Examination was repeated until conidia appeared. The incubation period is defined as the time elapsing between infection and the formation of fructifications. The results demonstrated that in Vojvodina [north-eastern part of the country] the incubation period is normally five days [cf. ibid., 13, p. 678]. Under exceptional optimum conditions the incubation period may be four days; it is rarely six or more, for example, during cold periods in May or in July in excessive heat. It was observed that the incubation period was prolonged by a day if the minimum temperature during this period fell below 11° to 12° C., and the average did not exceed 16° to 17°, or if the maximum temperature was 38° or more, with an average of not less than 29·5°. Temperatures in the range 14·8° to 27·7° had no effect on the length of the incubation period, and variations in relative humidity usually encountered locally had practically no influence. The different varieties had a certain effect on the length of incubation period, but only if the temperature was unfavourable for the development of the pathogen.

Baldacci (E.). **Il calendario d'incubazione della Peronospora della Vite e le sue possibili applicazioni.** [The incubation calendar for the Vine *Peronospora* and its possible applications.]—Reprinted from *Ann. Accad. Agric. Torino*, 91, 2, 8 pp., 1948–1949. [Received March, 1950.]

The author has already indicated the observations to be made to determine the probable incidence of primary infections by *Peronospora* [*Plasmopara viticola*] on vines in northern Italy [*R.A.M.*, 28, p. 269] in order to apply preventive treatments. For the determination of subsequent treatments it is necessary to note the number of days when the vines receive rain for at least one hour and to estimate from the incubation calendar [loc. cit.] the probable date of the appearance of the mould and carry out the treatment one to three days before this date.

Further studies (*Atti Accad. Georgof. Firenze*, 1947) have shown that the incubation periods are the same in every locality along the northern slope of the Appennine chain. It is considered that the regions of northern Italy and of Tuscany can avail themselves of the incubation calendar to advantage as a means of controlling *P. viticola*. In regions where fog and dew are prevalent the applicability of the calendar is, according to observations made up to the present, limited to the first treatments.

Report on plant virus classification and nomenclature.—*Ann. appl. Biol.*, 37, 2, pp. 329–330, 1950.

S. H. Crowdy, G. Samuel, I. W. Selman, and I. W. Prentice, representing a subcommittee of the Plant Pests and Diseases Committee of the Association of Applied Biologists, after having considered the various existing systems of nomenclature and classification of plant viruses, put forward the following recommendations. (1) Until a system of naming viruses has been adopted at an International Botanical or Microbiological Congress, virus workers in Great Britain should

continue to use the old-established method of referring to plant viruses by the descriptive names of the diseases they cause with the word virus added—e.g., tobacco necrosis virus, potato leaf roll virus, etc., and the virus strains be designated similarly, e.g., tobacco mosaic virus, enation strain. (2) To give uniformity, pending a decision on nomenclature by an International Congress, virus workers should use, when possible, the names in the List of Common Names of Virus Diseases used in *Rev. appl. Mycol.* [*R.A.M.*, 24, p. 513]. (3) Supplements to or revisions of this list should be published at intervals, based on revisions by specialists in particular groups. (4) (Supported by the first three authors only.) Virus workers in Great Britain should refrain from using Holmes's scheme [ibid., 29, p. 197], which the authors consider fundamentally unsound and misleading.

Bawden (F. C.). **Plant viruses and virus diseases.**—xvi+335 pp., 1 pl., 60 figs., 2 diags., 5 graphs, Waltham, Mass., U.S.A., The Chronica Botanica Company; London, W.C. 2, Wm. Dawson and Sons Ltd., 1950. $6. 48*s*.

The author states in the preface of this third (entirely revised) edition of his treatise on plant viruses [*R.A.M.*, 24, p. 137] that it is largely a new book, one chapter and many new illustrations having been added and the text almost entirely rewritten. During the last six years many new virus diseases have been described; much has been done on the factors that affect spread, and new insect vectors have been discovered. The purification, chemical constitution, and morphology of many viruses have been further elucidated. The new chapter (8) deals with quantitative methods of assaying for viruses (formerly discussed in chapter 2) and includes the use of local lesions [ibid., 29, p. 348], starch-iodine lesions, and precipitin tests.

Pirie (N. W.). **A biochemical approach to viruses.**—*Nature, Lond.*, 166, 4221, pp. 495–496, 1950.

Viruses may be studied by both chemical and biological methods. The use of biochemical methods, however, brings with it a danger of over-simplification. The applicability of some chemical methods to the study of a group of substances is not a guarantee that these substances are amenable to all other chemical criteria. Evidence that one of the smaller molecules has a certain constitution excludes all other constitutions that are not equilibrium states of the first. On the other hand the zoological or botanical criteria for a species are often satisfied by individuals covering a wide range of size, shape, and colour. If we rank biochemical and biological objects in order of size it is not necessary to go far along the size-scale to find variable structure associated with essentially the same activity. It is probable that viruses, which are in this size range, are variable.

There is no *a priori* reason to assume that infection can lead to the production of only one anomalous nucleoprotein or that the ability to initiate infection in a new host is a property confined to one ideal unique structure. If an important feature of infection with tobacco mosaic virus is a gross derangement of nucleoprotein metabolism, it follows that in gaining an understanding of the mechanism of infection all the anomalous nucleoprotein must be studied. Attention must not arbitrarily be restricted to one size and shape of particle of the range present in the infected plant [*R.A.M.*, 29, p. 538]. The term 'virus' should be employed with circumspection, as we have no means of defining criteria for its exact use.

Smolák (J.). **Virové choroby a listy.** [Virus diseases and leaves.]—*Ochr. Rost.*, 22, 5–6, pp. 173–203, 14 pl., 1 fig., 1949. [Russian and English summaries.]

Detailed descriptions are given of leaf reactions of various plants presumably affected by virus diseases in Czechoslovakia. These include *Spiraea pumila* variety Anthony Waterer, showing mosaic or chlorosis (or both simultaneously), the

incidence of which is common; various varieties of *Acer pseudoplatanus* with mosaic and leaf deformations in a park in Poděbrady, where several trees are reported to have been destroyed by the disease, and of *A. negundo*; a lime tree (*Tilia cordata*) affected by mosaic in the park of Dobříš Castle; and raspberry (both wild and cultivated), the virus diseases of which are unusually widespread [*R.A.M.*, 7, p. 333; 10, p. 78]. These are divided symptomatologically into the intergrading types (A) mosaics, (B) leaf deformations, (C) leaf reductions, and (D) destruction.

Kvíčala (B. A.). **Virusové choroby rostlin s hlediska moderního nazíraní.** [Modern views on plant virus diseases.] —*Ochr. Rost.*, 21, 1–2, pp. 12–26, 1948. [English summary. Received July, 1950.]

The author reviews the present state of knowledge of virus diseases and discusses their symptomatology, the nature of viruses, modes of transmission, and economic importance and control.

Gulval Experimental Station. Growers' notes and station record, year ending March 31, 1950.—46 pp., Ministry of Agriculture & Fisheries, National Advisory Service, South-Western Province, Bristol, 1950. [Mimeographed.]

H. W. Abbiss reports that during the period under review the area served by Gulval Experimental Station [Cornwall] escaped much of the heavy losses from virus diseases of broccoli suffered in England as a whole [cf. *R.A.M.*, 28, p. 261; 29, p. 342], probably because in Cornwall there is a break in brassica growing when young broccoli seedlings are being raised. Field observations suggested that Home Guard potatoes [ibid., 28, p. 193] are particularly susceptible to lime-induced manganese deficiency [cf. ibid., 28, pp. 82, 158, 537; 29, p. 476], and this was confirmed; affected leaves contained only 12 p.p.m. manganese, as against 30 to 40 p.p.m. for normal potato leaves.

Winter browning of anemones [ibid., 29, p. 304] is not usually serious before Christmas, but becomes more noticeable towards the end of the season. One form of the condition appears as a dry, brown discoloration and shrivelling of the leaflets, sometimes accompanied by distortion. In severe cases the leaf fails to develop and the leaf-stalk terminates in a blackened stump. The available evidence suggests a disease of fungal origin. Leaf damage of various kinds contributes to the condition. In wet weather winter browning often ends in a black and rotten 'sludge' condition of the plants. Rotations should be as long as possible, the remains of a diseased crop in the soil being an important source of infection. Organic nitrogenous manures are preferable to inorganic, and checks to growth on soil deficient in humus also render the plants susceptible. Well-grown crops on land well supplied with humus seem to withstand the onset of winter browning to some extent.

Harris (R. V.). **Plant pathology**—*Rep. E. Malling Res. Sta., 1949*, pp. 40–42, 1950.

In this report [cf. *R.A.M.*, 29, p. 199] it is stated that buds and gum were found to be additional over-summering sources of infection of *Pseudomonas morsprunorum* and *P. prunicola* [loc. cit.] on stone fruits. The evidence suggested that while most of the bacteria are no longer viable in the leaf spots in October, the leaf spot nevertheless provides a large amount of inoculum for the initiation of cankers in autumn. The superiority of home-made Bordeaux mixture over the manufactured copper preparations tested in the control of the disease on cherries [loc. cit.] was confirmed. Severe leaf-spotting and later wholesale shoot infection of apricot trees is associated with a bacterium not yet identified. Symptoms were reproduced by inoculation with isolates.

Symptoms of apple mosaic [ibid., 24, p. 22; 28, p. 578] were shown to develop on

Malling rootstocks Nos. I, II, IV, VII, IX, XII, XVI, and Crab C. These are unlikely to act as symptomless carriers.

Progress Report 1934–1948. Division of Horticulture, Central Experimental Farm, Ottawa.—259 pp., 28 figs., 3 diags., 6 graphs, [? 1950].

In this report it is stated that of the severe diseases of strawberries in Canada, mildew (*Sphaerotheca humuli*) is usually sufficiently prevalent to permit the ready identification in breeding work of susceptible seedlings in the field in their first fruiting year. Leaf spot (*Mycosphaerella fragariae*) [*R.A.M.*, 18, p. 191] rarely becomes epidemic in the seedling plantation. Many stocks of strawberries in Canada are infected with an [unspecified] virus causing degeneration but the commonly grown varieties do not show readily identifiable symptoms.

Surveys from 1943 to 1945 of raspberry varieties planted in 1940 at the Division of Horticulture, conducted in co-operation with the Division of Botany and Plant Pathology, disclosed that Chief, Cuthbert, Latham, and Ottawa were the most severely affected by mosaic [ibid., 14, p. 642], and the disease spread quite rapidly in these varieties. Herbert, Indian Summer, Madawaska, Marcy, Milton, Tahoma, Trent, and Washington showed no mosaic symptoms, and only one case of leaf curl [ibid., 10, p. 393], in the variety Marcy, was found in the whole plantation. Late yellow rust (*Pucciniastrum americanum*) [ibid., 24, p. 5] was most severe on Ottawa, some plants being almost completely defoliated in 1943. Viking, a parent of Ottawa, was moderately susceptible and five out of ten seedlings with Viking ancestry showed some degree of susceptibility. Gatineau, Rideau, Taylor, Trent, and Washington were moderately susceptible to leaf spot (*Septoria rubi*) [ibid., 23, p. 135]. Ottawa is quite susceptible to powdery mildew (*Sphaerotheca humuli*), the amount of infection depending upon location and season. All the Lloyd George × Newman 23 hybrids, including Gatineau, Madawaska, Marcy, Rideau, Taylor, and Trent were moderately to highly susceptible to anthracnose (*Elsinoe veneta*). Washington was the most susceptible variety; Tahoma was also moderately affected. Chief, Latham, Monroe, Newburgh, Newman 23, Ottawa, and Viking showed only slight infection. Madawaska, Rideau, and Taylor were the most susceptible to spur blight (*Didymella applanata*). Other varieties of similar parentage such as Gatineau and Marcy were only slightly to moderately susceptible.

In 1945 a yield trial was laid down at Ottawa consisting of the ten black currant selections resistant to rust (*Cronartium ribicola*) [ibid., 29, p. 570]. On the basis of the first full crop harvested in 1948, 0–381 (Crusader) [ibid., 28, p. 631] and 0–393 (Coronet) [loc. cit.] were two of the highest yielding rustless varieties, equalling Climax and Magnus, but being slightly less productive than Kerry and Saunders. In an attempt to produce rust-resistant red currants [ibid., 22, p. 392] of better horticultural value than Viking, it was crossed with Cascade, Red Lake, and Stephens No. 9. All the seedlings which have fruited to date are resistant to rust.

The Canadian pear varieties Miney and Moe, and the United States introductions Mendel, No Blight, Patten, Patten 1200, and Parker appear to be resistant to fire blight [*Erwinia amylovora*: ibid., 29, p. 290]. Mendel has remained free from infection for eight years.

Eden, a selection from Elmira asparagus, is suitable for growing in most localities and is resistant to rust [*Puccinia asparagi*: ibid., 24, p. 216].

Ottawa BA–2, a bean [*Phaseolus vulgaris*] selection from the cross Red Kidney × Unrivalled Wax, possessed some resistance to anthracnose [*Colletotrichum lindemuthianum*] and proved moderately tolerant of bacterial blight [*Xanthomonas phaseoli*] at Ottawa and Vancouver. In preliminary breeding tests carried out during 1948 with 91 strains and varieties of beans, interplanted with susceptible varieties, the following remained free from halo blight (*Pseudomonas medicaginis* var. [f.sp.] *phaseolicola*) [ibid., 28, p. 44] and common blight (*X. phaseoli*) [ibid.,

24, p. 5] during the season: Bountiful, Brittle Wax, Coco Bicolor du Pape, Fordhook Favourite, French Horticultural, Giant Stringless Green Pod, Idaho Refugee, Improved Kidney Wax, Logan, Noir de l'Hermitage Amélioré, Pencil Pod Black Wax, Refugee, Round Pod Kidney Wax, Rustproof Golden Wax, Sensation Refugee 1066 and 1071, Stringless Black Valentine, and Surecrop. In inoculation tests with these organisms three varieties showed only slight infection and seed from these is being increased for further testing and breeding.

Laxall, a pea selection from Laxton Progress × Earliest of All which has a wide range of adaptability and is suited to prairie conditions, possesses high field resistance to *Fusarium* root rot [*Fusarium* spp.: ibid., 29, p. 345] at Ottawa. Engress (English Wonder × Laxton Progress) has consistently shown moderate tolerance in the field. Other varieties which appeared to be tolerant of this disease included Sterling, English Marrowfat, Brown Eyed Susan, Alaska, White Elephant, Small Round, and Green Scotch. Ottawa PE–1 and PE–2 possess some resistance to root rot and to some strains of *Ascochyta pisi* [ibid., 28, p. 439]. Of the pea pathogens *A. pisi*, *Mycosphaerella pinodes* [ibid., 26, p. 330], and *A. pinodella*, *A. pisi* is the most widespread in Eastern Canada, but *M. pinodes*, if present, causes the most injury. In breeding experiments initiated in 1939 the selections A–100, A–101, A–107 and *Pisum elatius* proved highly resistant to some strains of *A. pisi* and work is in progress to transmit this partial resistance to more desirable horticultural varieties.

One of the tomato crosses made in 1938 to 1939 was Rutgers × Allred, the former being somewhat tolerant of *Alternaria solani* and *Septoria* [*lycopersici*: ibid., 29, p. 291]. Ottawa TO–4 selected from this cross, and TO–16 are also fairly tolerant of *A. solani*. In 1947 when early blight was severe, certain of the parental varieties, *Lycopersicon pimpinellifolium*, Early Rutgers, Devon Surprise, Golden Perfection, Danmark, and Ottawa TO–8, appeared to transmit at least moderate resistance to their progeny. Ottawa TO–15 appeared to have some resistance. In neither the preliminary nor the first regular test carried out in autumn, 1948, for resistance to late blight (*Phytophthora infestans*) [ibid., 29, p. 203] was there any indication of resistance, although San Rais and San Marzano appeared to be somewhat less susceptible than the other strains tested. The Danmark Hybrid tomato is claimed to possess resistance to leaf mould (*Cladosporium* [*fulvum*: ibid., 28, p. 493]).

In 1947 the cabbage variety Rossebo remained free from black rot [*Xanthomonas campestris*: ibid., 28, p. 26] which was prevalent in Danish Ballhead and other varieties in adjacent rows.

The cucumber variety Ohio No. 31 is claimed to be resistant to mosaic [virus].

The results are given of studies on the control of magnesium deficiency in commercial apple orchards [ibid., 19, p. 545] and on brown heart in turnips [boron deficiency: ibid., 29, p. 142] and various deficiencies in tomatoes. Specific symptoms of deficiencies in certain vegetable crops and ornamentals are also given [ibid., 29, p. 54].

As the result of experiments carried out since 1934 in various localities to determine the effect of boron applied to apple trees suffering from corky disorders [ibid., 18, p. 119; 19, p. 353], the following recommendations are made for orchards on acid soils: 4 oz. borax for trees up to 10 years old, 8 oz. for 10 to 20 years, and 8 to 16 oz. for older trees. If boric acid is used the rates should be two-thirds of these. If the soil is alkaline and high in calcium carbonate borax should be incorporated with the regular spray at the rate of 2½ lb. to 100 gals. spray, applied at the time of the calyx and second cover sprays. These measures have been employed every three years in the Hendricks orchard near Trenton, Ontario, and have given complete control of cork disorders with no apparent deterioration in fruit quality. In an effort to prevent the occurrence of bitter pit [ibid., 22, p. 438] growers are recommended to avoid treatments which promote excessive growth. If bitter pit is present the amount of nitrogenous fertilizer should be reduced or withheld

entirely. In some cases it may be necessary to adopt a sod mulch in place of a clean cultivation system. All fruit from trees showing bitter pit at harvest time should be marketed immediately, since storage pit may develop in fruit apparently free from bitter pit at harvest. The results of branch unit solution injection tests on the variety Duchess bore out the commonly accepted view that water core [ibid., 18, p. 687] is more prevalent under high nitrogen conditions. Since it is also more prevalent on young trees, the growth of susceptible varieties should not be forced by heavy applications of nitrogenous fertilizers or manure.

In preliminary tests ortho hydroxybiphenyl [*o*-phenylphenol] dissolved in sunflower seed oil on a weight ratio of 8 to 200 and impregnated in wraps at the rate of 0·2 gm. per sq. ft. reduced storage rots of apples by 70 per cent.

Studies on the influence of pre-storage factors on the incidence of core flush [ibid., 22, p. 437] disclosed that the disorder was heavy where high nitrogen was applied, but was reduced somewhat when phosphorus was applied as well. Samples from injected limbs suggested that calcium also reduced susceptibility to core flush. When susceptibility was not too great the disorder was controlled by storage at 39° F. and by picking at a stage of advanced maturity.

In the control of superficial scald [ibid., 17, p. 464] in McIntosh, Fameuse, Baldwin, Rhode Island Greening, and Wagener apples, the effectiveness of shredded oiled paper was 60 to 70 per cent. that of oiled wraps. With the latter less than 10 per cent. of the apples were affected by scald. For efficient control fruit should be wrapped prior to ten weeks in storage. Efficient control was obtained by dipping Rhode Island Greening apples in oil emulsions (from 2 to 100 per cent.) of sunflower seed oil emulsified with unemul (a form of aluminium oxide).

The seedling hybrid L. 37.10.01 from the lily Lyla McCann appeared to be more resistant to *Botrytis* blight [*B. elliptica*: ibid., 26, p. 154] than many others tested and has been used recently in plant breeding.

Where seepage irrigation is available, black heart of celery [due to boron deficiency: ibid., 20, p. 192] may be controlled by the maintenance of an even supply of moisture. On non-irrigated muck land the use of a properly balanced fertilizer with minor element deficiencies corrected will reduce the severity of the disorder.

Report of the Science Service, Canada Department of Agriculture, for the year ended March 31st, 1949.—110 pp., 1949. [Received May, 1950.]

Of the Botany and Plant Pathology section of this report [cf. *R.A.M.*, 28, p. 440] the part dealing with mycology and miscellaneous projects (pp. 47–72) has already been noticed from another source [ibid., 29, p. 80]. In the Botany section (pp. 36–47) it is stated that a 4–4–40 Bordeaux mixture retarded the rate of photosynthesis of potato plants, while a 4–2–40 mixture had a stimulating effect. Neither mixture affected the rate of respiration.

Severe symptoms of winter injury of coniferous trees throughout eastern Canada became apparent in spring, 1948. The pines as a group and white pines [*Pinus monticola* and *P. strobus*] especially were more severely affected than any other conifers. On the whole, damage was confined to a partial killing of the foliage with a resulting decrease in the growth rate.

Considerable intensification of Dutch elm disease (*Ceratostomella ulmi*) [ibid., 29, p. 542] occurred in the eastern part of the infected area in Quebec south of the St. Lawrence River. Infected trees were found within approximately 25 miles of the Maine border, 16 miles of the New Hampshire border, and 20 miles of the borders of Vermont and New York. A single infected elm with typical symptoms was discovered in the City of Ottawa. Positive cultures were also obtained from 13 other trees in six counties in eastern Ontario. It appears that the causal fungus has only recently reached Ontario and is existing as a saprophyte in dead wood and bark.

Interfertility tests were used in verifying the identifications of isolates of *Fomes roseus*, *F. subroseus*, *Polyporus adustus*, *P.* [*Polystictus*] *versicolor*, *Poria monticola* and *Trametes serialis*. There was partial fertility between certain isolates of *Peniophora mutata* and *P. allescheri* which suggests that *P. allescheri* should be reduced to synonymy under *P. mutata*. Pairings in a series of 17 monospore mycelia of *Poria albipellucida* showed that the fungus is heterothallic and of the bipolar type of interfertility.

The results of further investigations on die-back of yellow and white birch [ibid., 28, p. 256] in the Maritime Provinces confirmed that the early stages of the disease appear to be independent of attack by the bronze birch borer [*Agrilus anxius*: loc. cit.]. The cause of rootlet mortality is not known, but it is suggested that because of the shallow rooting habit of birches, even a minor decrease in precipitation might produce drought injury to the root system. The fungi most commonly isolated from both living and dead tissues of affected trees were *Phomopsis* sp., *Melanconis nigrospora*, *Melanconium* sp., and *Prosthemium* spp. Of these *Phomopsis* sp. appeared most consistently and produced limited infection when mycelial cultures were inoculated into wounds.

First Annual Report of the Commonwealth Scientific and Industrial Research Organisation for the year ended 30th June, 1949.—137 pp., [? 1950].

The following matters of phytopathological interest are contained in this report [cf. *R.A.M.*, 29, p. 288]. Yellow leaf dwarf virus of tobacco [ibid., 25, p. 539], observed for the first time in North Queensland in 1948 and also present in Western Australia, is not important. Recent experiments have shown that the vector, *Orosius argentatus*, acquires sufficient quantities of the virus to become infective after feeding for one minute on a diseased plant and can transmit the virus in five minutes. Fifteen common local host plants, experimentally infected, all proved to be symptomless carriers. Big bud [tomato big bud virus: ibid., 17, p. 351] is present in all tobacco areas but is seldom important. In greenhouse tests the interval between infection and the appearance of symptoms ranges from two weeks to a year. The occurrence of big bud in the field in tobacco plants affected with yellow dwarf was confirmed in greenhouse tests. Rare natural infection of potato with big bud was confirmed once.

A field survey, begun in 1947, of the occurrence of die-back or gummosis of apricot trees caused by *Cytosporina* sp. in Australia [ibid., 28, p. 406 and next abstract] has shown that there are 50 per cent. or more affected trees in the non-irrigated areas of South Australia and Tasmania, where almost a third have been destroyed or are very badly affected, but fewer in the irrigated part of South Australia. The disease is not serious in southern areas of Victoria, the Goulburn Valley, and the Murrumbidgee irrigation area. There is a general association between incidence and severity of the disease and soil water conditions. Further investigations are in progress.

In the plant diseases section of the report (pp. 26–27) it is stated that *Thrips tabaci* [ibid., 29, p. 288], the only known vector of [tomato] spotted wilt virus on potato present in the area studied, was the second most numerous species. There was no field transmission of the disease in 1948–9.

In varietal trials for resistance to common scab (*Actinomyces scabies*) of potato, Cayuga, Ontario, and 1537–12 were highly resistant wherever grown [loc. cit.] but did not equal other varieties in yield.

Medium Brownell and Commonwealth Potato Collection 1417 (a clone of *Solanum andigenum*) again maintained their resistance to *Rhizoctonia* [*Corticium*] *solani*. Young shoots of C.P.C. 1417, detached before emergence, were resistant to rotting by *C. solani* in pure culture on mineral salts agar.

Work on combining resistance to potato viruses A, X, Y, and leaf roll [ibid., 29, p. 425] in hybrids is being continued.

A line of *Lycopersicon pimpinellifolium* has been found resistant to tomato spotted wilt virus. The plants have been back-crossed with large-fruited types. Field trials under epidemic conditions have confirmed the resistance of the hybrid lines.

Witches' broom virus disease of lucerne is prevalent throughout the inland areas of Queensland, New South Wales, Victoria, and South Australia and has been reported from north Western Australia. The disease was transmitted by grafting and by *O. argentatus* from lucerne to a number of other hosts. Infected plants consistently produce a virescence of the floral parts very similar to that caused by tomato big bud on its hosts.

It has again been confirmed (p. 64) that Bordeaux mixture sprays cause bitterness in the juice of mature Valencia oranges due to the development of limonin and one of its oxidation products.

It is stated (p. 72) that *Pinus radiata* sleepers, pressure-treated with oil preservatives and installed in six different localities, are performing excellently and even after 12 years' service appear likely to give longer service than untreated eucalyptus sleepers.

Report of the Waite Agricultural Research Institute, South Australia, 1943–1947.—x +109 pp., 1950.

Some of the information in the section of this report [cf. *R.A.M.*, 23, p. 248] dealing with plant pathology (pp. 45–50) has already been noticed from other sources [ibid., 29, p. 288]. During 1947 a loss of at least 4,000,000 bush. of wheat was sustained in South Australia as a result of widespread attacks of rust (*Puccinia graminis*) [cf. ibid., 28, p. 622; 29, p. 503] and take-all (*Ophiobolus graminis*) [ibid., 28, p. 52].

The development of root rot of peas, caused by *Pythium* spp., chiefly *P. debaryanum* [ibid., 28, p. 203] was conditioned by the water content of the soil. In pot experiments emergence ranged from nearly the maximum in soil near the wilting point to nil in soil with a high water content. Part of the difference in this behaviour appears to be due to the relative effects of different water contents on the diffusion from peas of substances stimulating the activity of *Pythium* in the soil. Wrinkle-seeded varieties yield these substances much more readily than smooth-seeded varieties and show extensive damage from pre-emergence rot in soils where smooth-seeded varieties are little affected [cf. ibid., 28, p. 152].

The incidence of apricot die-back or gummosis, associated with a *Cytosporina* [see preceding abstract] was found to increase with the age of the trees. A survey of representative orchards in Tasmania and South Australia showed that among ten-year-old trees 30 to 40 per cent. generally had at least one branch affected, while some of those 25 years old or more were completely affected. It appears that the fungus is disseminated for considerable distances by air, and may perhaps be the imperfect state of an Ascomycete. Special attention is being given to a species of *Cryptovalsa* commonly present on dead apricot twigs.

Bacterial blight of cherries (*Pseudomonas* sp.) was prevalent in the spring of 1946 and caused considerable loss of crop. Work on this disease is in progress.

Sprays containing fermate or nomersan were as effective as Bordeaux mixture against celery blight (*Septoria*) [*apii*: ibid., 27, pp. 59, 116, 273; 28, p. 436] or slightly more so. Trials also showed that frequent applications of Bordeaux mixture tended to cause stunting.

Twenty-third Annual Report of the Department of Scientific and Industrial Research, New Zealand, 1949.—88 pp., 1949.

Reporting the work of the Plant Diseases Division (pp. 49–52) [cf. *R.A.M.*, 28, p. 377] G. H. Cunningham lists buttercup, wild radish, cape gooseberry [*Physalis*

peruviana], *Primula malacoides*, *Schizanthus*, and *Viscaria* as additional hosts of tomato spotted wilt [virus] in New Zealand [ibid., 26, p. 231]. Several strains of the virus have been separated, but further purification is necessary before their exact number can be determined. The natural host range of cucumber mosaic [virus: ibid., 28, p. 37] now includes celery and *Delphinium*. Two of seven lines of cucumbers introduced from the United States showed resistance under test conditions. Tomato aucuba mosaic (a strain of tobacco mosaic virus) has now been found in New Zealand, having developed to the extent of 100 per cent. in two glasshouses in Auckland during the past season. Losses were much heavier than with the type strain. Beet mosaic, which until recently has been confined to the Manawatu [ibid., 26, p. 39], has appeared in Canterbury. The natural host range of lettuce mosaic [ibid., 28, p. 503] now includes groundsel. The virus is non-persistent in the vectors, *Myzus persicae*, *Macrosiphum solanifolii*, and *Aphis gossypii*, the last-named being a new record. Yields are greatly reduced when plants are infected early in the season. The virus has been transmitted artificially to pea, sweet pea [*Lathyrus odoratus*], endive, aster, cineraria, and marigold, the last four being new host records. Strawberry crinkle virus is widespread in the Dominion. In the Auckland and Waikato districts a severe yellow and green leaf mottling in the Captain Cook variety appears to be the same disease as June-yellows in the United States [ibid., 27, p. 430]. The disorder is not graft-transmissible. Strawberry red-core [red stele] (*Phytophthora fragariae*) [ibid., 24, p. 128] is prevalent in Auckland Province and is also present in Wellington and Canterbury. Of 15 nurseries examined, 8 were found to be infected, severity being highest in soils having a high moisture content. Preliminary investigations into a bold yellow mottling of hop leaves from a garden in the Sherry River district of Nelson, have shown the condition to be transmissible by inarch grafting. Similar symptoms have been observed on hops from Tasmania being grown at Levin. Plum mosaic [? peach mosaic virus] occurs naturally on apricots and Japanese and English plums and is transmitted by budding. The natural host range of apple mosaic virus [ibid., 28, p. 578] now includes several varieties of crab apples. It has also been transmitted experimentally to hawthorn [*Crataegus* sp.] and loquat.

Of the Improved Bay State tomato plants, a variety imported from the United States [ibid., 28, p. 380], 10 per cent. showed a high degree of resistance to leaf mould [*Cladosporium fulvum*], *Lycopersicum peruvianum* [ibid., 26, p. 379] being completely resistant. *Verticillium dahliae* [ibid., 29, p. 233] was the only fungus isolated from plants showing typical wilt symptoms. The fungus has been found on stock [*Matthiola*], aster, fat hen [*Chenopodium album*], and black nightshade [*Solanum nigrum*]. Averages of 21 and 12 per cent. infected plants were found in glasshouse tomato crops and 44 and 20 per cent. in the field.

The percentages of survival in United States watermelon varieties tested for resistance to *Fusarium bulbigenum* var. *niveum* [ibid., 28, pp. 48, 54] were: Hawkesbury 88, Klondyke R7 57·1, Blue Ribbon 30·4, Klondyke black-seeded 14·8, and Klondyke brown-seeded 15·3.

A comprehensive survey of 51 commercial pea crops in Canterbury and 25 in Auckland showed that the most widespread and serious disease was collar rot (*Ascochyta pisi*, *A. pinodella*, and *Mycosphaerella pinodes*), 11 crops being attacked severely, six moderately, and 46 slightly. Downy mildew (*Peronospora viciae*), although widespread, caused little injury. Of 16 crops infected with wilt (*Fusarium* sp.) six were severely attacked; *Fusarium* foot rot (*F. solani* var. *martii*) was found in five crops, one being severely attacked. Stem blight [*Pseudomonas pisi*], although uncommon, is becoming more prevalent in the Blenheim and Nelson districts. In resistance tests Greencrop, the least susceptible variety tested, showed 53 per cent. infection.

Of the 16 linseed varieties tested for resistance to *Melampsora lini* [ibid., 23,

p. 474] with rust collected from Canterbury and Southland, Sheyenne and B5128 (from North Dakota Experiment Station) were highly resistant and Golden Viking moderately so. Of seven fibre varieties tested, Wada, Cascade, Argentine II, and the Russian selections Strakhanovetz, D. 83, and 806/3 were highly resistant [cf. ibid., 28, p. 288]. So far two races of this rust have been isolated in New Zealand. Of 95 linseed crops in Canterbury, Otago, and Southland, browning (*Polyspora lini*) [ibid., 27, p. 19] was present in 14, mainly in Southland, where five were severely infected. Pasmo (*Sphaerella linorum*) [ibid., 23, p. 17] was found in 21 crops, mainly Golden Viking, three crops being severely infected. Wilt (*Fusarium lini*) [ibid., 27, p. 20] was found in one crop (Punjab) in North Canterbury.

The apple fireblight organism, *Bacillus amylovorus* [*Erwinia amylovora*], remains viable on fruit spurs, following blossom infection, until bud movement the following spring. Consequently control by use of copper sprays may prove effective.

The control of crown gall (*Bacterium tumefaciens*) has been attempted by modifying the soil pH and by chemical treatment of plants in field and glasshouse. Artificially injured plants developed galls while uninjured transplants formed very few irrespective of soil reaction. Colchicine [ibid., 26, p. 238] prevented gall formation and also induced breakdown of those already formed, but has not yet killed the bacteria. Dioxane was effective in preventing galls, but did not significantly reduce the size of those already formed.

R. Thomson, reporting on tobacco research (pp. 60–65), states that an inspection made in January of the tobacco fields of 25 representative growers revealed less mosaic [virus] infection than in previous years. In six experiments the average amount of initial mosaic was 10 per cent. in plants grown from direct seeding in tobacco beds and over 30 per cent. in pricked-out plants. Field plots planted with tobacco grown under standard treatment showed only 3 per cent. initial mosaic against 43 per cent. with pricked-out plants. In a handling test, touching 1 per cent. infected material resulted in 93 per cent. infection compared with 1·4 per cent. in corresponding untouched plants. Chloropicrin at 4 c.c. per sq. ft. on land heavily infected with *Verticillium* wilt [*V. albo-atrum*: ibid., 27, p. 117] gave complete control; DD reduced the amount of disease. The varieties T. 448 A and Ky. 34 were relatively resistant. A survey of tobacco beds in different parts of Waimea County showed only light infection with black root rot (*Thielaviopsis*) [*basicola*: ibid., 28, p. 5]. Of the cover crops grown in infested soil Algerian and Garton oats, barley, white clover, and vetch did not contract infection; ryecorn [? rye × wheat hybrid] and red clover had less than 1 per cent., Pink Bitter lupins 69 per cent., Sweet Yellow lupins 3 per cent., and Sweet Blue, Sweet White, and New Zealand Blue, 34, 29, and 54 per cent. infection, respectively. In all cases the growth of the crops remained unaffected. In seedling-bed tests Delcrest tobacco was the most resistant to black root rot, the 49 per cent. infection being only slight; Vesta (all strains), Harrison's Special 215 and 218, Special 400, and Special 402 all showed general infection of the roots. Fermate considerably reduced collar rot (*Sclerotinia* [*sclerotiorum*]) of tobacco seedlings planted in infected soil, but did not give satisfactory control.

Annual Report, Cawthron Institute, Nelson, New Zealand, 1948–49.—50 pp., [1949].

In this report [cf. *R.A.M.*, 28, p. 4] it is stated that results obtained with a colorimetric method for zinc determinations based on dibeta naphthylthiocarbazone compared favourably with those from the polarograph method. The results from apple leaf samples suggested that Gravenstein leaves have a lower zinc content (22·3 p.p.m. average) than Sturmer and Jonathan (34·8 and 39·5 p.p.m., respectively). Wood from leader branches had the lowest zinc content (34 p.p.m.) and spur bark the highest (81 to 501 p.p.m.). From all tests there is no evidence of widespread zinc deficiency in the Nelson district. Cherry trees in the Tasman

district affected with die-back [cf. ibid., 25, p. 124] benefited considerably from zinc sulphate sprays, the zinc content of the leaves being 34·8 p.p.m. compared with 15·6 for unsprayed.

Jonathan trees at Harakeke set fruit poorly and had small leaves, which were poor in colour and susceptible to spray burn. Copper deficiency [ibid., 26, p. 112] appeared to be an important factor and a spring Bordeaux spray resulted in improved foliage and fruit set. Dougherty apple trees which had received no potassium for 20 years had pronounced die-back with small, light green leaves and small, poorly coloured fruit. There was little scorch. In trees lacking phosphorus, die-back was less severe, the leaves were dark brown with a purple tinge and red petioles. Trees with no nitrogen had produced little growth but had very little die-back.

Die-back of raspberry bushes [cf. ibid., 20, p. 72] was prevalent in many parts of the Nelson district, being severe on granite soils in the Ngatimoti locality and bad in the Motupiko and Tadmor Valleys especially in two gardens heavily limed in recent years. Symptoms include failure of the fruit buds to develop or their early collapse followed by the dying back of the cane. In less severe cases leaves are deeply indented and crinkled. Plots treated with boron were outstanding in the development of fruiting spurs and foliage in the second season compared with poor growth on plots not so treated. Copper improved foliage growth also.

Nelson clay loam used extensively for tomato culture is more conducive to hard-core [ibid., 28, p. 5] than many other Nelson soils.

In a survey of diseases affecting hops, black root rot (*Phytophthora* sp.) [ibid., 28, p. 593], canker caused by *Gibberella* sp. and *Fusarium* sp., and leaf symptoms suggesting virus disease (mosaic or nettlehead) were found, but no wilt (*Verticillium albo-atrum*). The gardens seriously affected with root diseases were those located on heavy soils with poor drainage or on sandy soils with a somewhat high water table. Chloropicrin retarded the growth of new hop cuttings in three badly affected gardens but later the plants grew very well.

Warnings have been issued to tobacco growers against the use of soil for seedling beds from locations (Spring Grove and Matucka) infested with black root rot (*Thielaviopsis*) [*basicola*: see preceding page].

Plant diseases.—*Agric. Gaz. N.S.W.*, 61, 6, pp. 293–298, 7 figs., 1950.

Downy mildew of rhubarb (*Peronospora jaapiana*) [*R.A.M.*, 5, p. 279; 22, p. 422] is widespread in New South Wales, but causes severe losses only during abnormally wet seasons. At first roundish to angular, fawn to light brown spots appear, which eventually enlarge until large sections of the leaf turn brown and die. These tear and fall out, the veins break, and the leaf becomes a lacerated mass. Under moist conditions the fungus is evident on the lower surface as a grey to fawn, downy growth. In wet seasons the plants should be sprayed thoroughly with 1–1–10 Bordeaux mixture before the disease appears. Spraying should be repeated at weekly intervals as long as humid weather prevails. At harvest all infected leaves should be burned. Vigorous growth affords a certain protection against the disease.

Calendula [*officinalis*] is damaged in most seasons by heavy attacks of rust (*Puccinia distincta*) [ibid., 20, p. 366]. All self-sown seedlings should be destroyed. As the first symptoms appear the plants should be thoroughly dusted with fine sulphur, or equal parts of sulphur and hydrated lime. Alternatively, spraying with colloidal or wettable sulphur is effective. Treatment should be repeated at intervals of about two weeks. All infected plants should be burned at the end of the season.

Purple patch of cereals, caused by *Rhizoctonia* [*Corticium*] *solani* [ibid., 17, p. 166; cf. 29, p. 503], though not considered of major economic importance, may occasionally cause considerable losses, particularly on central and south-western

slopes. Besides wheat and oats [loc. cit.], barley, rye, and wild oats may be attacked. Control measures include applications of ammonium sulphate [loc. cit.] and a rotation scheme in which bare fallowing is practised. The disease is invariably more severe in stubble-sown crops; the incidence is higher in poorly-worked fallow than in well-cultivated land.

Most stocks of lilies, daffodils [ibid., 27, p. 524], and bulbous irises are infected with mosaic, believed to be caused by distinct, but related strains of cucumber mosaic virus [ibid., 28, pp. 174, 563]. The symptoms are most clearly expressed on the maturing leaves, and consist usually of light green, yellow or silver mottling in longitudinal stripes or rectangular patches, and distortion. Infected plants flower poorly and the flowers may be malformed. The very susceptible *Lilium speciosum*, *L. auratum*, and *L. longiflorum* lose vigour and become easily invaded by bulb-attacking fungi and insects. The control measures recommended for daffodils should be used for all bulbous plants. Anemones and *Ranunculus*, which suffer from a similar type of mosaic, should be renewed from seed every few years.

Annual Report on the Agricultural Department, Nigeria, 1948.—75 pp., 1949.

The following items of phytopathological interest occur in this report [cf. *R.A.M.*, 29, p. 144]. According to A. V. Gibberd, only a very small area of cacao remained to be surveyed in Nigeria at the end of 1949. As far as is known the occurrence of swollen shoot [loc. cit.] is confined to an area within a thirty miles' radius of Ibadan. This includes some of the most thickly planted cacao land in the Western Provinces, and it is imperative to bring the disease under control as soon as possible. Eradication by cutting out was begun in 1946 [ibid., 28, p. 271] and proceeded until July, 1948, when it had to be suspended. By this date, some 525,000 infected trees, equivalent to 1,050 acres of cacao, had been destroyed. The preliminary treatment of all farms known to be infected was approaching completion and several areas were believed to have been freed from the disease. The suspension of control at this stage must prove costly, since the disease has been allowed to spread unchecked. However, by the end of 1948 agreement was reached to resume cutting out under European supervision as soon as the 1948–9 main crop harvest was completed. The rehabilitation grant has been increased to 2*s.* 6*d.* per tree, with no proviso regarding replanting.

To obtain information regarding local methods of cultivation a close study of the practices is being carried out on selected farms in all the principal cacao-growing areas, using observation plots. One half of each plot is managed by the grower and the other by the Department of Agriculture. The results obtained during the first season indicate a considerable increase in yield from the departmental plots largely as a result of the control of black pod (*Phytophthora palmivora*) [ibid., 26, p. 191; 28, pp. 277, 565].

T. A. Russell states that in the Cameroons cacao damage caused by *P. palmivora* might be reduced by close seed planting (5 ft.), by thinning to one seedling per stand, and by gradually thinning the young trees to a final spacing of 15 ft. Undergrowth should be cut frequently. The collection of swollen shoot virus strains from Nigerian cacao [cf. ibid., 25, p. 494] was maintained in insect-proof houses, and new strains added. An outbreak at Alaparun, near Moniya, some 20 miles from Ibadan, although within 15 miles of other outbreaks, displayed certain peculiar features, no swellings being present on the shoots and the leaves showing a distinctive mosaic [cf. ibid., 27, p. 515].

A preliminary survey under the direction of F. W. Toovey, Officer in Charge, Oil Palm Research Station, of oil palm diseases in native palmeries and European plantations was carried out in the Southern Provinces and in the Cameroons from mid-January to mid-April. The general health of the palms in the native palm groves was good, in marked contrast to the incidence of [unspecified] leaf blights,

crown diseases, root and trunk rots, and wilts in both nursery and field plantations, due mainly to deficiency of water or of soil nutrients [ibid., 21, p. 196; 28, p. 394]. Second in importance is *Ganoderma lucidum* [ibid., 26, p. 235], which caused a basal decay of palms three to five years old in plantations, and a trunk rot of palms thirty to forty years old in plantations and native palmeries. In some areas this disease is causing anxiety to the inhabitants. *Fusarium oxysporum* f. *elaeidis* [cf. ibid., 29, p. 507] was found in two plantations at Sapele and Calabar. At the latter station *Penicillium wortmanni* was associated with *F. oxysporum* f. *elaeidis* in the necrotic vascular bundles. *Fusarium* wilt has not yet been recorded from native palmeries in Nigeria.

T. A. Russell reports that in tobacco grown from imported seed at Ago Are in Oyo Province a serious epidemic of leaf curl [cf. ibid., 26, p. 82; 27, p. 544; 28, p. 491; 29, p. 61] greatly reduced the crop. Infection appeared to have started in the central nurseries, and the virus probably perennated on some alternate host. A. Pickles states that white flies, presumably vectors of the disease, persisted in the affected locality to the end of the year. The disease of *Mucuna aterrima* recorded by West in 1934 has now been proved to be due to a virus readily transmitted by mechanical inoculation. Spread in the field is rapid, and the condition seems to be increasing at Moor Plantation.

J. H. Gisborne states that blackarm [*Xanthomonas malvacearum*: ibid., 29, pp. 80, 465] was very prevalent among the Maiduguri cotton strains at Zaria with heavy boll shedding in all plots. The incidence of boll disease [? *Nematospora gossypii*, *N. coryli*, and related species: cf. ibid., 27, p. 361] at Gusau, Daudawa, Samaru, and Kontagora was estimated by Mr. Geering as affecting 8·8, 7·7, 3·8, and 13·7 per cent. of the locks, respectively.

Pady (S. M.), Hansing (E. D.), & Johnston (C. O.). **Kansas mycological notes : 1946.**—*Trans. Kans. Acad. Sci.*, 50, 1, pp. 45–54, 3 figs., 1947.

Hansing (E. D.) & Johnston (C. O.). **Kansas phytopathological notes : 1947.**—ibid., 51, 3, pp. 318–323, 1948.

Hansing (E. D.), Johnston (C. O.), Melchers (L. E.), & Fellows (H.). **Kansas phytopathological notes : 1948.**—ibid., 52, 3, pp. 363–369, 1949. [Received June, 1950.]

In the first of these further publications on the occurrence, distribution, severity, and importance of plant diseases in Kansas [cf. *R.A.M.*, 26, p. 442] it is stated that *Helminthosporium victoriae* [ibid., 29, p. 255] was first observed on oats in the State in 1946, the highest loss of about 35 per cent. being in Neosho oats in Douglas county. On the whole, however, the disease was of minor importance.

Some of the barley varieties growing at the Experiment Station developed a leaf necrosis in the form of a narrow elongated stripe. In several cases the leaf became shredded and torn. The disorder was identified as a physiological condition, false stripe. It is readily distinguished from the true stripe disease (*H. gramineum*) by the absence of fungal fructifications and by its localized effect.

In May, 1947, unusually widespread and heavy infections of *Erysiphe graminis* [ibid., 28, p. 388] occurred on winter wheat across the centre of the State from south to north. At Manhattan infections were so heavy that they interfered with the development of other leaf diseases.

Losses from *H. victoriae* amounted to 6,000,000 bush. of grain at a farm value of $6,000,000. Losses were also greater in Iowa, Nebraska, and other States in 1947 than in 1946.

The hot, dry weather in August and September favoured the development of charcoal rot (*Sclerotium bataticola*) [*Macrophomina phaseoli*: ibid., 29, p. 207] on sorghum and maize, and *Nigrospora oryzae* on maize [ibid., 28, p. 453], losses from these diseases being greater in 1947 than they had been for several years.

During 1948 wheat mosaic [ibid., 29, p. 17], usually so slight in Kansas that it passes unnoticed, was widespread on early emerged wheat and caused considerable losses in the north-western part of the State. In some fields in Norton and Ecatur counties they amounted to 75 per cent. of the crop.

Anthracnose (*Colletotrichum graminicola*) caused breaking over and weakness of broomcorn [*Sorghum bicolor* var. *technicus*] and the development of poor brush in south-western Kansas. This is the first definite report of the disease on broomcorn in the State. It may have been introduced on seed imported from Illinois where it is already well known [ibid., 22, p. 475].

Oregon's agricultural progress through research.—*Sta. Bull. Ore. agric. Exp. Sta.* 477, 140 pp., 48 figs., 1 graph, 1950.

In this report [cf. *R.A.M.*, 29, p. 83] it is stated that two new wheats resistant to smut [*Tilletia ?caries*], Elmar and Brevor, developed in Washington, are being released in the Columbia basin. The reduction of blind seed disease [*Phialea temulenta*] of *Lolium perenne* [ibid., 29, p. 101] attained in 1949, may be further reduced in 1950 if badly infested, unburned fields are spring ploughed. The removal of the maximum amount of light weight seed during harvesting operations in 1949 may also help to reduce the disease potential and will be generally effective in 1950. Lime-sulphur (4 gals. per 100 gals.) is recommended as the best control material for raspberry yellow rust [*Phragmidium rubi-idaei*: ibid., 29, p. 266].

The sporadic occurrence of fleck in Croft lilies [ibid., 29, p. 83] is due to the transmission of western cucumber mosaic virus [ibid., 28, p. 599] from cucumbers or possibly primrose and polyanthus [*Primula* spp.] common in the area. Three strains of cucumber mosaic virus from cucumbers induced fleck in lilies and one from a polyanthus caused streak, a severe form of fleck.

Report of progress for year ending June 30, 1949.—*Bull. Me agric. Exp. Sta.* 473, 84 pp., 10 figs., 1 map, 1949.

In this report [cf. *R.A.M.*, 21, p. 321] M. T. Hilborn states that in a severe test in which delayed pre-bloom and petal-fall applications were given for the control of apple scab [*Venturia inaequalis*], phygon [ibid., 28, p. 68; 29 p. 416], bioquin 1 [ibid., 28, pp. 445, 446], and a mixture of elemental sulphur and dithane all reduced fruit scab to less than 1 per cent. There was 3 and 4 per cent. infection, respectively, with good-rite z.a.c. [zinc dimethyl dithiocarbamate cyclohexylamine complex] and arathane [dinitrocapryl crotonate], and 8 per cent. with elemental sulphur. Half-strength mixtures of puratized agricultural spray [ibid., 28, p. 68] and fermate, and the former with elemental sulphur gave good control, while concentrated sulphur applied to foliage by means of an air blast was excellent. Concentrated spray applications of many organic fungicides are to be studied in the future. M. T. Hilborn, F. H. Lathrop, B. E. Plummer, and A. S. Getchell report that when equivalent amounts of sulphur were applied, the greatest deposit on apple foliage occurred when concentrate spray was used and was three times that from spraying with hand guns; dusts were intermediate. A modified, home-constructed boom [cf. ibid, 27, p. 529] for spray pumps of 25 to 35 gals. per min. capacity has been designed by M. T. Hilborn, F. H. Lathrop, F. J. McDonald, and C. Crocker.

A. E. Prince, D. Folsom, and Marilyn Noyes report that extensive collections were made of blighted twigs of blueberries [ibid., 27, p. 29], a disease which has become more prevalent in recent years. *Pullularia pullulans* was the most common of 15 fungus species in over 200 isolations; it was also isolated from leaf spots.

In potato vine killing experiments P. J. Eastman, M. Goven, and B. E. Plummer found that haulms treated in mid-August when they were actively growing were

difficult to kill and tended to produce new growth. On 8th September thorough coverage with sinox general and dow 66 improved gave a rapid kill, the arsenicals and cyanamide an intermediate and a slow rate, respectively [ibid., 29, p. 380]. Discoloration of tubers did not occur to any great extent with the rotobeater [loc. cit.]. In 1948 discoloration due to rapid or late killing faded before digging but not when potatoes were stored at 36° and 50° [F.] between November and March.

R. Bonde, J. A. Robinson, and B. E. Plummer report that four new liquid dithiocarbamates controlled potato blight [*Phytophthora infestans*] satisfactorily in 1948. Copper nitrodithioacetate was superior to the zinc salt, but neither was equal in control to Bordeaux or tribasic copper sulphate or for yields. COCS (copper oxychloride sulphate) [ibid., 28, p. 483], copper zinc chromate [ibid., 29, p. 429], dithane D–14, dithane D–78, and parzate controlled blight and gave good yields. Copper-lime dust containing DDT [ibid., 27, p. 331] controlled late and early blight [*Alternaria solani*] better when freshly mixed. R. Bonde and D. Merriam state that Katahdin 'seed' with a trace of mahogany browning (cold injury) [ibid., 27, p. 92] in 1948 yielded 148 barrels per acre compared with 165 from uninjured seed. Severely browned seed yielded only 139 and the stand was reduced from 95 to 78 per cent. Seed potatoes were examined for ring rot [*Corynebacterium sepedonicum*; ibid., 29, p. 431] and the healthy ones grown for increase and distribution. Puratized N5E, puratized agricultural spray, and copper sulphate continue to be promising as equipment disinfectants. Several new potato varieties have remained uninfected for four or five years even after freshly cut seed pieces were contaminated with ring rot bacteria. Resistant varieties were found least likely to be masked carriers of the disease. Katahdin seed stocks may be infected with ring rot and show no symptoms until the following season. A water suspension of zinc carbamate appeared to be valuable for treating cut seed potatoes. Concerning storage and transit D. Folsom and H. Q. Roach report that the percentage of tubers with discoloured tissue and those showing mahogany browning increased in transit for shipments from Maine to New York City, in April and May 1948. There was less increase when stored at 67° than at 47°. Of about 150 Green Mountain bins selected in Aroostook county 140 were free from net necrosis, 3 to 13 per cent. occurred in five bins. Shipments from these five showed no significant increase in net necrosis between Maine and New York City.

M. T. Hilborn reports that DDT was promising in the control of lettuce yellows [aster yellows virus: ibid., 26, p. 436] in large scale experiments when applied as a 3 per cent. dust five times during the growing season. The disease was reduced to 6 per cent. on the treated plots compared with 77 on the untreated.

Wetenschappelijke bevordering van de landbouw in de laatste honderd jaren. [Scientific progress of agriculture in the last hundred years.]—*Chron. Nat.*, 106, 6, pp. 246–275, 1950.

This survey of the work accomplished by the Royal Society of Natural Sciences in Indonesia during the last hundred years contains a number of items of phytopathological interest. An introductory survey is contributed by C. van der Giessen, and sections are included on rice (J. G. J. van der Meulen), sugar-cane (V. J. Koningsberger), tobacco (J. Schweizer), tea (J. H. van Emden), coffee (P. J. S. Cramer), cacao (K. Ebes), coco-nut (P. M. L. Tammes), *Cinchona* (K. Ebes and G. Verhaar), and *Hevea* rubber (P. J. S. Cramer). Reference is made to the literature on some important diseases of these crops, including root rot of rice [potassium deficiency: *R.A.M.*, 22, p. 110], sereh disease of sugar-cane, slime disease of tobacco [*Xanthomonas solanacearum*], potash deficiency of tea, and coffee rust (*Hemileia vastatrix*) and top die-back (*Rhizoctonia* sp.), and to plant breeding investigations, notably in connexion with *Cinchona* and rubber.

Massey (L. M.). **Crown gall.**—*Amer. Rose Annu.*, 35, pp. 145–153, 5 figs., 1950.

This is a useful summary of the information on the history, geographical distribution, economic importance, symptoms, etiology, and control (by exclusion, eradication, protection, and immunization) of crown gall (*Agrobacterium* [*Bacterium*] *tumefaciens*) of roses [*R.A.M.*, 19, p. 348; 23, p. 179], based on 26 contributions to the literature on the subject.

Dantas (B.). **A epifitologia e o contrôle da 'vassoura de bruxa' e da 'podridão parda' do Cacaueiro—bases teóricas e resultado economico.** [The epiphytology and the control of the 'witches' broom' and 'brown rot' of Cacao—theoretical bases and economic results.]—*Bol. Agric., Pernambuco*, 16, 3–4, pp. 239–253, 2 figs., 1 graph, 1949.

Following an introductory description of the cacao plant and of the environmental conditions prevailing in the plantations of Amazonia, Brazil, a full account is given of the symptomatology, epiphytology, and control of two destructive diseases limiting the cultivation of the crop, namely, witches' broom (*Marasmius perniciosus*) [*R.A.M.*, 23 p. 379] and brown [black] pod (*Phytophthora palmivora*) [ibid., 26, p. 334]. Following closely the course of the infection of the latter disease, the writer ascertained that the average daily growth rate of the lesions on the pods under humid conditions approximates to 15 mm., resulting in total involvement in ten days. Dew must be continuously present for nine hours to ensure spore germination of *P. palmivora*. In the Belém region the moisture demands of the fungus are satisfied even during the driest month of November. On the other hand, the activity of *M. perniciosus* is restricted to the period from January to May, when the very heavy rainfall (over 240 mm. monthly) and high humidity permit the formation of fruit bodies. The basidiospores germinate on susceptible organs in an hour in the presence of dew, and penetration through the stomata follows immediately. Under dry conditions, however, germinability is lost in just over an hour, so that any spores produced in dry weather or after sunrise are necessarily innocuous. Conversely, all those disseminated during the night were shown to be ecologically capable of producing infection.

Three successive methods may be adopted for the control of witches' broom [cf. ibid., 29, p. 14] and black pod rot [ibid., 28, p. 565], namely, elimination of infection foci, adjustment of environmental conditions, and chemical treatment. At the end of the dry season, i.e., during the last fortnight of November or the early part of December, the brooms, cankered adventitious twigs, and spotted and mummified pods should be excised and buried, or preferably burnt. The remaining inoculum must be provided with conditions adverse to further development. To this end the period of dew settlement in the microclimate of the plantation must be curtailed, the entrance of a measure of direct light being permitted so as to hamper sporulation, germination, and infection. Shade for new plantations should be provided by leguminous trees with very small leaves, spaced so that the canopies do not become densely interlaced. In established plantings the shade trees should be pruned, especially the lower branches impinging on the crowns of the adjacent cacao trees, or excessive numbers thinned. The ground flora should be mown, particularly the monocotyledons, the lower leaves of which harbour rain water and dew for many hours after sunrise. The first treatment with 1 per cent. Bordeaux mixture plus 0·1 per cent. wheat flour should be applied during December, the second in March, and the third in the second fortnight of May or the first part of June. In an experimental planting of 140 trees the number of witches' brooms was reduced from 132 to 55 by this schedule in 1948. The economic aspect of spraying is discussed and proposals are made for the testing of various substitutes for Bordeaux mixture. The new mist-blower apparatus would appear to be the most suitable for use in the Amazonian cacao plantations.

Delap (Anne V.). **The application of trace elements to alkaline soils.**—*Rep. E. Malling Res. Sta., 1949*, pp. 116–117, 1950.

When peat (at the rate of 22 tons dried peat per acre) was soaked either in water or in manganese sulphate solution at 0·1 per cent. or 1 per cent. (0·75 or 7·5 cwt. manganese sulphate per acre), and applied to a highly alkaline soil (pH 8) in which cereals had shown severe symptoms of manganese deficiency [*R.A.M.*, 29, pp. 18, 19], wheat, oats, and barley sown on the plots treated with peat plus water showed better growth than the plants in the untreated plots, though grey speck and chlorosis were present and the plants presented a 'flattened' appearance. Those receiving 0·1 per cent. manganese sulphate were in better condition, though they were pale green, with chlorotic stripes, while those receiving 1 per cent. made good growth and the leaves were dark green.

Andrén (F.). **Resultat av betningsförsök 1948–49.** [The result of disinfection experiments 1948–49.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1950*, 1, pp. 11–15, 1950.

Most of the cereal seed-grain disinfectants included in the 1948–9 trials at the Stockholm Plant Protection Institute [*R.A.M.*, 28, p. 566] were effective against wheat bunt [*Tilletia caries* and *T. foetida*]. The number of diseased plants on an average of four tests was reduced from 298 to less than 1 per 10 sq. m. by aagrano, ceranit T, certosan, and lunasan, all at 200 gm. per 100 kg. seed, while the mercury-free tritisan at the same dosage also gave good results (1·3). The heaviest increase in yield (5,965 kg. per ha. as against 5,205 kg. in the control plots) was produced by hormotan at 200 gm. per 150 kg., followed by betoxin 61 (200 gm. per 200 kg.) with 5,800 kg., the latter preparation also reducing the number of infected plants to 1·5 per 10 sq. m.

Aagrano, hormotan, lunasan, and täyssato [ibid., 28, p. 279] gave good control of barley stripe disease [*Helminthosporium gramineum*], reducing the number of diseased plants from 474·5 to less than 2 per 10 sq. m. The maximum yields of 3,650 and 3,640 kg. per ha., as against 2,445 kg. in the control plots, were produced by panogen DGSV and betoxin 61, respectively (4·4 and 2 diseased plants).

The very high incidence of loose smut of oats [*Ustilago avenae*] (700 infected plants per 10 sq. m.) was reduced to a minimum of 0·4 by aagrano, followed by panogen (1), lunasan (1·6), and hormotan (2·4). The yields in the plots treated with these preparations were 3,300, 3,450, 3,400, and 3,430 kg. per ha., respectively, compared with 2,740 kg. in the controls.

Fischer (H.). **Zur Schwarzrostanfälligkeit der Mahonia aquifolium Nutt.** [On the susceptibility to black rust of *Mahonia aquifolium* Nutt.]—*Z. PflKrankh.*, 57, 1–2, pp. 1–4, 1950.

When revised regulations for black rust (*Puccinia graminis*) control were drawn up by the Schleswig-Holstein plant protection authorities, in close co-operation with the nursery associations, following the epiphytotics of 1931 and 1932 [*R.A.M.*, 14, p. 88], the cultivation of *Mahonia aquifolium* was provisionally freed from the restriction imposed on the principal alternate hosts, i.e., exclusion from an area within 200 m. of arable land. This step was taken with considerable misgivings and its temporary nature was made perfectly clear in transactions with the nurserymen. Now that over 15 years have elapsed since the promulgation of the relevant order, a review of the experience gained in the interval appears to be indicated.

Damage of varying extent from black rust was reported in the years 1933, 1934, 1936 to 1938, and 1946, and in all cases infection could be traced to the common barberry, the removal of which resulted in freedom from the disease during the next year. Data are cited to illustrate the intensity of the 1946 outbreak in rye

fields exposed to infection from barberries inadvertently interplanted in a nursery with the immune *Berberis thunbergii*. In the middle of a field 50 m. distant from the barberries the number of seeds per 100 ears was 3,420 and their total weight 64·2 gm., the corresponding figures at distances of 300, 1,000, and 3,000 m. being 3,510 and 64·03, 3,690 and 119·54, and 4,478 and 164·1, respectively. A sum of RM. 2,033 was agreed upon as compensation to the farmers in respect of the loss of 107 doppelzentner [1 doppelzentner = 100 kg.] of rye. The total area involved was about 15 ha. Taking the average yield for the locality in 1946 as 13·7 doppelzentner per ha., the loss incurred through the presence of a few barberries within a 1-km. radius may be computed at 52 per cent. of the harvest, without regard to the uselessness of the straw.

During the entire period under review *M. aquifolium* has been cultivated on a large scale, frequently in close proximity to cereal crops, but no case of associated infection by *P. graminis* has been observed. Previous to 1939 the shrub was regularly exported in bulk, and a number of consignments were returned on grounds of alleged black rust infection. In every instance, however, the suspected pustules were found on examination to be those of *Uropyxis mirabilissima* [*Cumminsiella sanguinea*: ibid., 20, p. 495; 26, p. 565]. *M. aquifolium* seems, therefore, to be of no practical importance in the spread of *P. graminis*.

Claims for damages resultant on common barberry cultivation during the 'thirties led to its general replacement by *B. thunbergii* and its various forms. No case of infection has been reported on any of the other 16 species of *Berberis* represented in local nurseries or on the crops in their vicinity. In view of these negative findings, the common barberry and its forms, e.g., *atropurpurea*, would appear to be the sole agents of black rust transmission.

Lowther (C. V.). **Chlamydospore germination in physiologic races of Tilletia caries and Tilletia foetida.**—*Phytopathology*, 40, 6, pp. 590–603, 1950.

The material used in these studies at the Washington Agricultural Experiment Station on chlamydospore germination in *Tilletia caries* and *T. foetida* at three temperature ranges represented most of the T– and L– races described by Rodenhiser and Holton [*R.A.M.*, 25, p. 209]. All the races germinated more rapidly at 18° to 20° C. than at 8° to 10°, while the most consistent rates of germination were obtained at 14° to 16°. The 25 races could be classified in five groups according to the time required for 75 per cent. germination at different temperatures. Group I comprised races T–5, T–6, T–7, and T–8, all of which germinated in seven days at 8° to 10° and in four at 14° to 16° and 18° to 20°. All the eight races of group II, viz., T–1, T–2, L–1, L–3, L–5, L–7, L–8, and L–10, required eight days at 8° to 10°; at 14° to 16° L–5 and L–7 needed five days and the others only four; and at 18° to 20° T–1 and L–5 germinated in five days and the rest in four. The requisite periods for group III, comprising T–3, T–9, T–15, T–16, L–2, L–4, and L–9, were nine days at 8° to 10°; five at 14° to 16° for T–3, T–9, L–4, and L–9 and four T–15, T–16, and L–2; five at 18° to 20° for T–3, T–9, T–15, and L–9, and four for T–16, L–2, and L–4. The four races of group IV, T–4, T–11, T–12, and T–14, germinated in 10 days at 8° to 10°; at 14° to 16° T–11 required four days and the others five; while at 18° to 20° the period necessary for T–11 was seven days and for the rest five. For T–10 and T–13 in group V germination took 11 days at 8° to 10°, five at 14° to 16°, and six at 18° to 20°.

In a test to determine the possibility of interracial differences in response to the deleterious effects on spore germination of the inclusion of nutrients in the medium [ibid., 7, p. 83; 9, p. 769] a temperature of 16° was maintained and three races of each species were used, T–5, L–1, and L–8 representing rapid germination rates while T–10, T–11, and L–9 were of the slower type. The latter appeared to be more sensitive to this factor than the former, only 1 per cent. germination occurring in

T–11, for instance, after ten days on standard potato dextrose agar, whereas L–8 reached its maximum on the same substratum in nine days. Very few of the promycelia, however, gave rise to primary sporidia. The spore germination rate was also significantly affected by the amount of agar in the medium. Above 2·5 per cent. the speed of germination, especially of T–11, decreased up to 6 per cent., the maximum concentration tested.

The rate of germination in 11-year-old chlamydospores of eight races was appreciably less than the corresponding values for fresh material. Here again interracial differences were apparent, e.g., between T–2 and T–7. Total germination of old spores was less than for fresh ones in T–1, T–2, and T–6 at 20°, and in the last-named also at 8°; for the other races it was equivalent to fresh material. There was no difference in germination rate or amount between fresh spores and those four or five years old [cf. ibid., 27, p. 416]. Immature smut balls of five races containing many hyaline spores gave a low percentage of germination, especially in the case of L–1 and L–8.

WAGNER (F.). **Auftreten, Sporenkeimung und Infektion des Zwergsteinbrandes an Weizen.** [Occurrence, spore germination, and infection of dwarf bunt of Wheat.]—*Z. PflBau PflSch.* (formerly *Prakt. Bl. PflBau*), 1, 1, pp. 1–13, 4 figs., 1 graph, 1950.

The average reduction in growth of wheat plants infected by dwarf bunt (*Tilletia caries*) in Lower Bavaria in 1947 [*R.A.M.*, 28, p. 388] was over 50 per cent. as compared with 30 per cent. for bunt proper. The diseased plants often do not attain a height of more than 20 cm.; tillering is abnormally luxuriant and precocity is a marked characteristic. Partially infected plants are of very frequent occurrence, the main stem producing a normal ear while all the lateral shoots are profusely branched, with bunt balls in the ears. In proportion to the reduced size of the plants, the balls of the dwarfing form of *T. caries* are smaller than those of bunt proper, besides being of a darker colour. In seasons of particularly favourable growth conditions for the host, the diseased plants may reach a height of 40 to 70 cm. and the dwarf bunt balls are of corresponding larger dimensions, approximating to those of the normal form. In many cases the content of the dwarf balls is firmer than in those of bunt proper, the spore mass appearing to be literally glued together, so that on pressure it disintegrates into minute fragments instead of into dust. Under the microscope the dwarf bunt spores may be distinguished by the sharper definition of their reticulations, imparting a setose appearance, from those of the common form.

The majority of the dwarf bunt samples collected in 1948 and 1949 originated in Lower and Upper Bavaria and Swabia, the numbers for the three regions in the former year being 29, 71, and 22 and in the latter 4, 8, and 18, respectively. A few collections were also made in the Upper Palatinate and Franconia. The maximum number of diseased plants in a given stand was 30 per 100 paces within a span covered by both arms, or appreciably less than the incidence of infection by bunt proper.

None of the 62 samples of dwarf bunt tested yielded germinable spores. On the other hand, spores of the ordinary form of *T. caries* germinated as follows in 0·3 per cent. calcium nitrate solution: in 4 out of 118 samples only isolated spores germinated, in 11 germination was low but regular, in 41 the maximum percentage was 5, in 38, 50, and in 24 over 50 [cf. ibid., 29, p. 16]. An inoculation experiment on sandy, humus-containing garden soil at Bayreuth, in which dwarf bunt spore material of the 1947 harvest was strewn over the ground and lightly hoed in two days before sowing, resulted in 45 per cent. infection. The growth reduction in the test variety Carstens V was estimated at 56 per cent. as compared with healthy plants, and tillering was profuse, the average numbers of haulms in infected and

normal plants being 4·25 and 2·57, respectively. Under appropriate conditions, therefore, the apparently ungerminable spores of dwarf bunt are quite capable of infection. In another test under different environmental conditions only 3·36 per cent. infection was obtained when the spore material was applied direct to the seed in the soil or dusted over it before sowing. In the case of bunt proper the latter method caused 46 per cent. infection. In a third experiment, dusting the seed with normal wheat bunt spores produced 33 to 44 per cent. infection compared with only a trace for the dwarf form. In general, the outcome of the author's experiments and those of American workers indicates that the dwarf bunt spores do not germinate immediately they reach the soil, but the process may extend over periods of varying length. In an experiment to clarify this point, dwarf and common bunt spores were strewn in open drills at the rate of 0·66 gm. per m. on 19th September, 1948, and Carstens V wheat was sown at weekly intervals from 21st September to 23rd November. In agreement with Bonne [ibid., 10, p. 649] and Winkelmann [ibid., 15, p. 144], the ordinary bunt spores were found to germinate immediately on contact with the soil, and hence are of little importance as a source of infection. On the other hand, those of dwarf bunt were still active on 16th November (8·47 per cent.). This is a matter of some importance in connexion with threshing operations, in the course of which infective dwarf bunt spores may drift on to the seed. Infection may also proceed from the diseased ears of the previous year's harvest, which frequently escape, owing to the shortness of the haulms, from the bound sheaves, especially in transport.

In plots at Bayreuth infested before sowing with common bunt spores (6 gm. per sq. m.), resulting in 29·78 per cent. infection, a pentachloronitrobenzene preparation brassicol [ibid., 28, p. 554] at 40 gm. per sq. m., applied immediately after sowing, gave complete control. At Munich the same fungicide largely eliminated both dwarf and common bunt (0·9 and 11·6 per cent., respectively, produced by soil inoculation with 1·2 gm. spores per sq. m.).

According to the present system of nomenclature, the agent of bunt proper in Bavaria is *T. triticoides* [ibid., 27, p. 468] and that of dwarf bunt *T. tritici* (of which *T. caries* is regarded as a synonym). However, if the dwarf bunt type of spores should also occur in common bunt, as seems probable from the relevant literature, the causal organism of the former disease must be considered as a subspecies, for which the trinomial of *T. tritici nanifica* is proposed, while *T. tritici tritici* would be the designation of the ordinary form.

Hervert (V.). **Pokus s mořením Pšenice proti sněti prašné (Ustilago tritici).** [A Wheat seed treatment experiment against loose smut (*Ustilago tritici*).]—*Ochr. Rost.*, 19–20, 10–11, pp. 78–81, 1947. [Russian summary. Received July, 1950.]

In 1943 at the Plant Protection Institute, Prague, Czechoslovakia, wheat grain of the very susceptible Dětenická, an unnamed German susceptible variety, and the resistant Huron Selection was subjected to three treatments for the control of loose smut (*Ustilago tritici*) [*R.A.M.*, 29, pp. 206, 295, 409, and next abstract]. They were: (1) hot water treatment for two hours at 45° C.; (2) four hours' pre-soaking at 25°, then 10 minutes at 52°; (3) four hours' pre-soaking at 25° and 10 minutes at 51·2°. Treatment (1) reduced the incidence of loose smut in the three varieties by 92, 92, and 100 per cent., respectively, (2) by 100 per cent. in all varieties, and (3) by 96, 99, and 100 per cent. The second method, though most effective, considerably reduced the germination of Huron Selection and the German variety.

Nattrass (R. M.). **Loose smut of Wheat.**—*E. Afr. agric. J.*, 15, 4, pp. 198–199, 2 figs., 1950.

Loose smut of wheat (*Ustilago tritici*) is stated to be of comparatively rare

occurrence in Kenya, but there is some indication that it may be increasing. For hot water treatment of the disease the seed is put into a sack with enough space left to allow for swelling and steeped in cold water for four hours followed by immersion in water between 52° and 54° C. for 10 minutes [see preceding abstract]. Barley after soaking for four hours in cold water is placed in water at 49° for five minutes and then steeped for 10 at 51° to 55°.

Winter (A. G.). **Weitere Beobachtungen über das Zusammenleben von Ophiobolus graminis und anderen Bodenmikroben mit Hilfe der Aufwuchsplatten.** [Further observations on the associations of *Ophiobolus graminis* and other soil micro-organisms with the aid of 'overgrow' slides.]—*Arch. Mikrobiol.*, 14, 4, pp. 588–593, 6 figs., 1950.

Continuing his studies at the Phytopathological Institute, Bonn, on the associations of *Ophiobolus graminis* and other micro-organisms, using Cholodny's 'overgrow' slide technique [*R.A.M.*, 29, p. 93], the author gives explanations of photographs representing (1) *O. graminis* and a concomitant fungus with paler, narrower hyphae; (2) and (3) the same, showing plectenchymatic hyphal 'tangles'; (4) *O. graminis* accompanied by Actinomycetes and parasitizing a soil fungus; (5) *O. graminis* colonized by an Actinomycete; and (6) a *Fusarium* sp. likewise colonized.

Stevens (N. E.) & Scott (W. O.). **How long will present spring Oat varieties last in the central Corn Belt?**—*Agron. J.*, 42, 6, pp. 307–309, 1950.

Clinton and related varieties constitute nearly 75 per cent. of the total area (about 10,000,000 acres) planted annually with spring oats in Iowa, Illinois, and Indiana. They are susceptible to the widespread race 45 of crown rust [*Puccinia coronata*: *R.A.M.*, 29, p. 612], perhaps the most important of all diseases affecting the crop in the United States. The effective life of the varieties Columbia and Marion has been prolonged by the failure of the Victoria × Richland derivatives caused by the inroads of *Helminthosporium victoriae* [see above, p. 24]. From the information now available it may be predicted that a new oat variety will be needed in the central Corn Belt every four or five years.

Blattný (C.) & Skočdopole (K.). **Některé souvislosti vyplývající z moření Žita proti fusariose—plísni sněžné.** [Some results of the seed treatment of Rye against fusariosis—snow mould.]—*Ochr. Rost.*, 19–20, 10–11, pp. 54–56, 1947. [Russian summary. Received July, 1950.]

In experiments carried out during 1943 to 1945 in Czechoslovakia, the losses of rye plants due to *Fusarium nivale* [*Calonectria nivalis*: *R.A.M.*, 10, p. 783 and next abstracts] in plots given [unspecified] treatment averaged 2·08 per cent. and the yields of 19·2 q. per ha., while the figures for untreated plants were 12·35 per cent. and 18 q. It is concluded that light snow mould infections do not cause serious yield reductions. Seed treatment, however, is recommended as it increases yields even in mild attacks. The importance of breeding resistant varieties is stressed.

Blattný (C.) & Skočdopole (K.). **Proč byla plíseň sněžná na Žitech v zimě 1943–44 mírnější než se čekalo?** [Why was the incidence of snow mould on Rye in the winter of 1943–44 lower than expected?]—*Ochr. Rost.*, 21, 1–2, pp. 40–48, 1948. [Russian summary. Received July, 1950.]

Although during the winter of 1943–4 snow fell on unfrozen ground in Czechoslovakia and did not melt until late in the spring, there was comparatively little snow mould [*Calonectria nivalis*: see preceding and next abstracts] on rye. The incidence in low-lying areas was negligible; at altitudes over 300 m. 10 to 20 per cent. of the plants were killed, but hardly any fields had to be ploughed under. Seed treatment [unspecified] before sowing is considered the main reason for the low incidence of the disease; other factors were the rapid melting of the snow-cover,

dry soil at the time of snowing, low temperature under the snow, the good physiological condition of the 1943 harvest, and the more general use of resistant varieties. Drainage of upland fields and treatment with potassium nitrate is recommended, while manuring should be avoided.

Sethofer (V.). **Studie o účinnosti suchých mořidel proti fusariose—plísni sněžné.** [Study on the efficacy of dry treatments against fusariosis—snow mould.]—*Ochr. Rost.*, 19–20, 10–11, pp. 56–76, 24 figs., 1946–7. [Received June, 1950.]

Studies were conducted from 1943 to 1946 at the Institute for Plant Protection, Prague-Dejvice, to develop an effective laboratory method for testing the properties of fungicidal dusts against *Fusarium* snow mould [*Calonectria nivalis*: see preceding abstracts] under optimum conditions for the development of the fungus. There were two lines of investigation in the main tests of their efficacy, (1) on totally infected rye grass seed and (2) on an infected agar medium, with determinations of the toxicity, solubility, adherence, absorption, effect on germination, and the size of the 'protective field' (zone of inhibition), or as it is called in the case of the mercury preparations the 'hydrargyrosphere'. Supplementary tests were made to determine the comparative effect of the preparation on uninfected seed, the germinability and initial infection of the grain by *C. nivalis*, and the control of seed infections.

The tests were carried out in Petri dishes covered by sterilized bell jars fitting closely to the outer rim and took ten days at 15° to 17° C. (2° to 3° less during the night).

The seed was inoculated by shaking with dried cultures of *C. nivalis*, or dusting with a conidial suspension, or by soaking for two minutes in a conidial suspension with subsequent drying at 15° to 18°. The inoculated grains were treated in the usual manner with the material to be tested, and placed on agar. The effectiveness of a preparation was evaluated from the infection rate of the grains.

In the infected medium tests the treated rye grains were placed on the culture medium, previously inoculated by spreading a conidial suspension over the whole surface and incubating for 8 to 12 hours at 20°. The grains are spaced in such a way that the effect of the preparation, especially the size and form of the zones of inhibition, are clearly discernible. Most conidia germinate in 3 days and the preparation begins to be effective after 8 to 12 hours, so that observations can be made after 60 to 64 hours.

The size of the inhibition zone or fungicidosphere depends on the rapidity of ionic dissociation and the effectiveness of the dissociant of the fungicide. It should be measured after five days, because by then all germinating conidia which came into contact with the dissociated material are believed to be killed. If the fungicidal activity spreads far beyond the margins of the visible inhibition zone the material dissociates gradually. If after five days the visible zone is sterile, regular in shape, with well marked margins, the relative toxicity of the material is good and so are the absorption properties. If the sterility and size remain unchanged during the whole test, the material dissolves slowly and is effective.

New [unspecified] preparations tested by the above methods proved effective also in field tests using both grain and soil infection, the snow cover being substituted by paper cuttings. But this method, which gave identical results, took nearly a month and the laboratory method, therefore, is more satisfactory.

Malan (C. E.). **Azione disgregatrice del Fusarium nivale sulle foglie di Segale in natura.** [The breakdown action of *Fusarium nivale* in the leaves of Rye plants in the field.]—*Nuovo G. bot. ital.*, N.S., 56, 1–2, pp. 244–246, 3 figs., 1949. [Received July, 1950.]

In a year when snow fell early in the Cottian Alps and rye plants were exposed

to particularly early and severe infection by *Fusarium nivale* [*Calonectria nivalis*: *R.A.M.*, 29, p. 200, and preceding abstracts], the author made a special study of the successive stages of the disease. In the first stage of attack the mycelium invaded the stomata and the intercellular spaces; the leaves lost their turgidity and became chlorotic. Abundant hyphae were found along the line of the veins between the epidermis and the underlying tissue. Later the cells themselves were invaded and the leaves became a diffuse pink due to the appearance of sporodochia. The mesophyll was permeated with hyphae and only a few cellular elements were still visible. In an advanced stage of the disease microchemical tests showed that only the epidermis and wood vessels had remained practically unchanged except for the cells having diminished in size. Having ceased to produce conidia the sporodochia dried out and the leaves, now transparent, fell off.

Scurti (I.). **Azione a distanza del micelio nelle neoformazioni da Ustilago maydis.** [Action at a distance of the mycelium in neoformations caused by *Ustilago maydis*.]—*Nuovo G. bot. ital.*, N.S., 56, 4, pp. 740–741, 1949.

Initiation of tumour formation in maize infected by *Ustilago maydis* [cf. *R.A.M.*, 21, p. 523; 23, p. 12] is always independent of the immediate presence of the mycelium, the hyperplastic action making itself felt from a distance. Each tumour results from cell proliferation and enlargement followed by fusion of the initial groups of cells of a meristematic type induced by diffusible factors originating at a distance. This effect is probably due to the action of some substance upon cells that become very susceptible when the host reaches a certain age and the parasite a certain stage of development.

Andrews (E. A.) & Janes (R. L.). **Stalk rot of Corn in Michigan during 1948.**—*Plant Dis. Reptr*, 34, 7, pp. 207–208, 1950. [Multilithed.]

A survey of 12 maize fields in Kalamazoo, Van Buren, and Cass counties, Michigan, to determine the cause of unusually heavy stalk breakage in 1949, showed it to be due chiefly to stalk rot [*R.A.M.*, 29, p. 504]. Severe shredding of the pith was found consistently on splitting the stalks lengthwise. In severely diseased stalks only the vascular elements remained. Scrapings of the white to pink mycelium on the surface of many of the stalks disclosed masses of *Fusarium* macroconidia, and internal tissue plantings yielded a preponderance of *Fusarium* sp., with *Nigrospora* spp. present in a few cases.

Klotz (L. J.). **Gum diseases of Citrus in California.**—*Circ. Calif. agric. Exp. Sta.* 396, 20 pp., 20 figs., 1950.

Brief notes, embodying the latest information available, are given on the symptoms, causes, and control of the following gum diseases of citrus in California: brown rot gummosis or foot rot (*Phytophthora citrophthora*, *P. hibernalis*, and *P. syringae*) [*R.A.M.*, 17, p. 313; 25, pp. 66, 302; 28, p. 213]; gummosis caused by *Botrytis cinerea* [ibid., 25, p. 558], *Sclerotinia sclerotiorum* [ibid., 24, p. 500], *Diaporthe citri* [ibid., 27, p. 116], *Diplodia* spp., and *Botryosphaeria ribis* [ibid., 21, p. 524; 26, p. 394]; dry root rot, generally associated with excessive moisture and poor aeration [ibid., 20, p. 394]; Rio Grande gummosis [ibid., 24, p. 446], which attacks only grapefruit in California; psorosis A and B and the associated conditions concave gum psorosis, blind pocket psorosis [ibid., 27, p. 361], crinkly leaf psorosis, and infectious variegation [ibid., 24, p. 98]; exocortis (bark shelling) [ibid., 27, p. 520; 29, p. 506] of trifoliate orange [*Poncirus trifoliata*]; and minor forms of gumming associated with *Penicillium roseum* [cf. ibid., 18, p. 451], *Fusarium* spp., *Alternaria* spp., *Schizophyllum commune* [ibid., 23, p. 25, *et passim*], insect injury, injury due to unneutralized copper sulphate or arsenicals, and copper deficiency (exanthema) [ibid., 24, p. 16; 25, p. 66 *et passim*].

Crandall (B. S.). **Gomosis de los Citrus.** [Citrus gummosis.]—*El Café de El Salvador*, 210, pp. 881–883, 1948. [Abs. in *Biol. Abstr.*, 24, 4, p. 1043, 1950.]

Gummosis of citrus in El Salvador is caused by *Phytophthora parasitica* [*R.A.M.*, 20, p. 401; 28, p. 62]. The author suggests prevention of the disease by high budding or control by excising cankers and painting [the wounds] with Bordeaux or copper carbonate paste. Varietal reaction to gummosis [ibid., 29, p. 208], in decreasing order of susceptibility, is sweet orange, lemon, grapefruit, rough lemon, Cleopatra mandarin, West Indian lime (*Citrus aurantiifolia*), and sour orange (*C. aurantium*).

Wager (V. A.). **Spraying for the control of black spot in Citrus.**—*Fmg S. Afr.*, 25, 292, pp. 226–228, 2 figs., 1950.

Black spot (*Phoma* [*Guignardia*] *citricarpa*) [*R.A.M.*, 29, pp. 208, 289] continues to menace citrus crops in South Africa.

In a recent greenhouse experiment at Durban dead leaves from trees which had shown no visible symptoms of the disease were suspended in a wire net above young lemon trees, and were sprayed for 10 minutes every two hours during the daytime for six days. Ten months later typical spots developed on the young lemon leaves.

In most new areas the disease appears first on smooth lemon trees, which are the most susceptible. In subsequent seasons the disease becomes apparent on neighbouring Valencia trees. Growers are advised to burn old, neglected lemon trees as a safeguard. To prevent latent infection from spreading, all nursery trees should be stripped of all their leaves before sale.

Extensive orchard tests from 1944 to 1948 have shown that the excellent control obtained with 2–1–80 Bordeaux mixture [loc. cit.] has proved spraying to be a commercial proposition. It is suggested that it should be applied with a casein spreader, starting at 2/3 petal drop, with two subsequent applications at six-week intervals. Scalicidal oil should be added in place of the spreader in the third spray. In wet seasons, or if blossoming is irregular, four sprayings at monthly intervals are advised. The cost per tree for the three sprayings is calculated at 1*s.* 2¼*d.*, which is approximately the difference in price between first and second grade oranges. The same treatment also controls sooty blotch (*Leptothyrium pomi*) [ibid., 28, p. 211].

Milbrath (D. G.). **Stem pitting of Grapefruit trees.**—*Bull. Dep. Agric. Calif.*, 39, 1, pp. 5–9, 3 pl., 1949.

The information in this paper, based largely on a recent contribution by Dr. Oberholzer and his co-workers, has already been noticed [*R.A.M.*, 29, p. 23].

Heim (R.) & Chevaugeon (J.). **La pourriture fétide du cœur du Cocotier au Cameroun.** [The fetid heart-rot of the Coco-nut in the Cameroons.]—*Rev. Path. vég.*, 27, 4, pp. 195–216, 21 figs., 1948. [Received November, 1950.]

In 1946 R. Heim examined shore-side coco-nut palms between Kribi, Cameroons, and Spanish Guinea which for some years had been affected by heart rot. The disease began as a rot and browning of one or several young heart leaves, and this symptom often coincided with a pale yellow discoloration, at first localized but gradually spreading, of a few old leaves. Both symptoms were present on some quite young palms. On older trees the entire crown appeared abnormal. On both young and old trees the heart necrosis appeared as a wet, malodorous rot, which was able to spread rapidly from the initial point of attack. The centre of the bud was quickly reduced to a mucous mass emitting a fetid odour and associated with the presence of bacteria. The apex of the central cylinder decomposed, the entire 'heart' becoming affected. The terminal bud and its surrounding leaves bent over

and finally fell off, the top of the trunk rapidly dying. The roots and the lower part of the trunk remained normal. In the grove to the south of Grand-Batanga three-quarters of the palms were dead or dying. The disease is stated to have come from Spanish Guinea, spreading northwards along the coast, and to be related, evidently, to some form of bud rot [cf. *R.A.M.*, 20, pp. 49, 112; 23, p. 165].

There was no evidence of any fungal infection preceding the bacterial attack; young specimens contained no mycelium in the tissues. The bacterium was present only in the parenchyma surrounding the vessels. Associated with the bacterium were various other organisms, probably saprophytic, together with *Fusarium semitectum* var. *majus*, *F. conglutinans*, and *F. dimerum* [cf. ibid., 19, p. 302; 22, pp. 405, 406], the characters of which are described in detail. Of these three, the second and third, at least, are probably saprophytic.

Crandall (B. S.), Abrego (L.), & Patiño (B.). **Investigaciones sobre enfermedades del Café. Informe No. 1, March 1, 1949.** [Coffee disease investigations. Progress report No. 1, March 1, 1949.]—*El Café de El Salvador*, 217, pp. 1425–1431, 1949. [Abs. in *Biol. Abstr.*, 24, 4, p. 1043, 1950.]

Investigations in El Salvador have shown *Rhizoctonia* [*Corticium*] *solani* [see next abstract] to be the agent of sore shin disease of coffee seedlings. Nursery root rot appears to be an early manifestation of the root disease found in the plantations [*R.A.M.*, 26, p. 104]. Black root rot apparently originates in the phloem tissue at the collar, cultures from infected tissue yielding a *Rhizoctonia* sp. (? *R. crocorum* [*Helicobasidium purpureum*]) in a large percentage of cases. Losses of coffee trees are commonly preceded by loss of the coffee shade trees *Inga edulis* and *Grevillea robusta* from a gummosis type of collar rot due to *Diplodia* sp. Other shade trees such as *Gliricidia sepium* and *Croton reflexifolius* are apparently parasitized by the same *Rhizoctonia* as that found on coffee. Root disease caused by *Rosellinia* sp., commonly reported in El Salvador in earlier literature, has not been observed.

Salazar (B.), Villareal (E. F.), & Vilanova (T.). **Estudios sobre el control del mal del talluelo en semilleros de Café hecho en el Centro Nacional de Agronomía.** [Studies on the control of the sore shin disease in Coffee seed-beds at the National Centre of Agronomy.]—*El Café de El Salvador*, 210, pp. 873–875, 1948. [Abs. in *Biol. Abstr.*, 24, 4, p. 1049, 1950.]

Soil treatments with sulphur gave the best control of the sore shin disease of coffee seedlings (*Rhizoctonia* [*Corticium*] *solani*) [see preceding abstract]. Granosan proved extremely detrimental to germination.

Pontis Videla (R. E.), Malaguti (G.), & Ravanello (G.). **Cultivo de Algodón en Venezuela, dañados accidentalmente por 2,4-D.** [Cotton crops in Venezuela accidentally damaged by 2,4-D.]—*Bol. Minist. Agric., Div. Fitopat., Maracay*, 2, 9 pp., 5 figs., 1950.

Symptoms suggestive of virus infection observed in cotton plantations at Guacara, Carabobo, Venezuela, in August, 1949, were tentatively attributed to the action of 2,4-dichlorophenoxyacetic acid, which had been applied to sorghum and maize crops in the vicinity [cf. *R.A.M.*, 28, p. 64]. The supposition was verified by an experiment in which three-month-old cotton plants were treated with solutions of the chemical ranging from 0·01 to 2 p.p.m. Serious injury resulted even from the lowest concentration, while dosages of 0·5 p.p.m. and upwards killed the plants.

The anomalies induced by the herbicide agreed with those reported by other workers and included various foliar distortions, a leathery consistency and thickening of the leaf blade, with very prominent, yellowish veins; striking malformation and wrinkling of the floral buds, with filiform sepals, wide open petals, and necrotic

spots on the stamens and pistils; hypertrophy of the shoots and longitudinal cortical fissures; and in severe cases pronounced enlargement and malformation of the tap-root similar to that caused by *Rhizoctonia* [*Corticium*] *solani*. In many plants the growth of the leading shoot was arrested and new branches arose from the lowest buds, resulting in an abnormal bushy habit. A month later the affected plants showed a remarkable reaction, forming new buds with apparently normal leaves and flowers.

Nisikado (Y.), Kimura (K.), & Myawaki (Y.). **On two Alternaria species injurious to Cotton fibers in bolls.**—*Ber. Ōhara Inst. landw. Forsch.*, 9, 2, pp. 238–251, 2 pl., 1943. [Received November, 1950.]

The recent revival of Asiatic cotton (*Gossypium herbaceum*) cultivation in the Okayama prefecture and elsewhere in western Japan has focused attention on the diseases of the crop. The present study, a preliminary note on which has already appeared [*R.A.M.*, 20, p. 461], is concerned with two species of *Alternaria*, *A. macrospora* [ibid., 28, pp. 31, 65] and *A. gossypii* (n.comb. for *Macrosporium gossypii* Jacz. [ibid., 9, p. 308]). The following additional information may be noted. The conidia of *A. macrospora* succumbed to five minutes' exposure at 54° C. and those of *A. gossypii* to the same length of time at 52°, while ten minutes at 50° destroyed both species. Also lethal to both were three-hour treatments with mercuric chloride 1 in 30,000, formalin 1 in 160, and uspulun 1 in 20,000. Copper sulphate inhibited mycelial growth at 1 in 100,000, but failed to kill the conidia even at a concentration of 1 in 10. Iron sulphate also arrested mycelial development at very low concentrations.

The following control measures are proposed. The crop should preferably be grown in regions free from excessive rain during the period following the opening of the bolls. Where this is impracticable *G. herbaceum* should be grown, as its bolls face downwards during development. Spraying with Bordeaux or other fungicides containing copper sulphate when the disease begins to develop is also recommended.

Bazán de Segura (Consuelo). **Podredumbre radicular del Algodonero.** [Root rot of Cotton.]—*Bol. Estac. exp. agric., Lima*, 37, 20 pp., 12 figs. (1 col.), 1949.

In connexion with the discovery, for the first time in Peru, of cotton root rot (*Thielaviopsis basicola*) [*R.A.M.*, 26, p. 449], the author presents the necessary information on the symptomatology of the disease, the macro- and microscopic characters of the fungus, evidence of pathogenicity, other hosts, and control. The field observations were made in the Ica Valley, where the average incidence of root rot on the two most severely infected plantations was estimated at 60 per cent. Typical symptoms were an abnormal swelling of the root-collar and a reddish-violet discoloration of the central portion of the root and of the cortical tissues. The dimensions of the endoconidia in malt agar cultures at 26° C. were 7·4 to 20·9 by 2·9 to 5·9 μ and those of the chlamydospores 18·1 to 54·5 by 8·6 to 12·1 μ. The colour of the colonies varied between deep olive, light brownish-olive, smoke-grey, white, and so forth. The local isolates developed more slowly than those from Arizona, supplied for comparison by J. H. Presley [ibid., 22, p. 21], but formed a much denser mat without zonation. The Peruvian strain of *T. basicola* is consequently regarded as a distinct race.

Leyendecker (P. J.). **Verticillium wilt on Cotton in New Mexico.**—*Pr. Bull. N. Mex. agric. Exp. Sta.* 1032, 8 pp., 3 figs., 1949. [Mimeographed. Received July, 1950.]

During the last ten years *Verticillium* wilt (*V. albo-atrum*) of cotton [*R.A.M.*, 29, p. 302] has become increasingly severe and destructive from California to North Carolina, and cotton production has ceased in certain fields in the irrigated

areas north and south of El Paso along the Rio Grande. As fields are irrigated soon after ploughing, ideal conditions prevail for the establishment of the fungus. This may be one of the ways the fungus spreads from isolated local areas to all parts of a field. Over-watering should always be avoided and recommended rotations practised [loc. cit.]. Damage is materially diminished by using raised double-row seed-beds (32 in. between rows, 48 in. across furrows) to raise the soil temperature. The American-Egyptian varieties Pima 32, Amsak, and SXP are well suited to the Rio Grande Valley north and south of El Paso and are less susceptible than Upland varieties. Of the last-named, 1517WR, Mesilla Acala, and 1517B show some tolerance of the disease.

Mains (E. B.). **Entomogenous species of Akanthomyces, Hymenostilbe and Insecticola in North America.**—*Mycologia*, 42, 4, pp. 566–589, 26 figs., 1950.

Technical notes are given on the following entomogenous fungi from North America: *Akanthomyces aculeata*, *A. angustispora* n.sp. on a beetle larva, *A. ampullifera* (Petch) n.comb. (syn. *Hymenostilbe ampullifera*) [*R.A.M.*, 17, p. 240], *A. aranearum* (Petch) n.comb. (syn. *H. aranearum*), *Insecticola* n.gen., *I. clavata* n.sp. on *Hapithus agitator* [var.] *quadratus*, *I. fragilis* n.comb. (syn. *Hymenostilbe fragilis*) [loc. cit.], *I. pistillariiformis* (Pat.) n.comb. (syn. *Isaria pistillariiformis*), *H. dipterigena*, *H. lecaniicola* (Jaap) n.comb. (syn. *I. lecaniicola* [ibid., 9, p. 454] and *Hirsutella lecaniicola*), *Hymenostilbe aphidis*, *H. formicarum*, *H. camponoti* n.sp. on *Camponotus* sp., *H. sphecophila*, and *H. verrucosa* n.sp. on spiders.

The new genus *Insecticola* has clavate, stipitate synnemata, the upper portions sporogenous. The terete stipes are composed of longitudinal, parallel, closely compact hyphae, the upper fertile portions compact, composed of repeatedly branching hyphae terminated by phialides forming a compact hymenium. The conidia are 1-celled, smooth, hyaline, and catenulate.

Thung (T. H.). **Grondonderzoek op Phytophthora sabdariffae.** [Soil investigation on *Phytophthora sabdariffae*.]—*Tijdschr. PlZiekt.*, 53, 3, pp. 86–91, 1947. [English summary.]

For the detection of soil and manure contamination by *Phytophthora sabdariffae* [apparently a nomen nudum] in crops of *Hibiscus sabdariffa* grown for roselle fibre production in Java [*R.A.M.*, 19, p. 220], a method is employed based on that devised by d'Angremond (*Meded. Proefst. vorstenl. Tabak* 43, 1920) for use in tobacco plantations infested by *P. parasitica* var. *nicotianae*. *Ricinus communis* leaves are used instead of the small and delicate ones of *H. sabdariffa*. They are covered for 24 hours with a paste of the soil or manure to be tested, which is then washed off and the leaves kept under humid conditions for a further 24 or 48 hours. The number of fungal lesions developing serves as a criterion of the degree of infestation. A more refined technique applied by the author [ibid., 18, p. 420] involves two hours' streaming of a soil or manure suspension over the leaves.

Nicklová-Navrátilová (Mme H.). **Usychání Lnu.** [Flax wilt.]—*Ochr. Rost.*, 22, 3–4, pp. 121–129, 6 figs., 1949. [English summary.]

Foot rot of flax, caused by *Phoma lini* and *P. exigua* [*R.A.M.*, 24, p. 450] is widespread in the border districts of Bohemia and Moravia, Czechoslovakia, especially when warm, wet seasons are followed by dry south winds. Under such conditions yields may suffer considerable losses. The two *Phoma* species are distinguished by the morphological characters of their spores and pycnidia [loc. cit.] and the distribution of the latter. Those of *P. lini* occur in groups on lesions, and those of *P. exigua* cover the whole lower part of the stem. Artificial infections were effective when cultures were added to the soil in pots. The author also frequently observed perithecia of *Rosellinia mammiformis*, particularly on the

leaves and seeds; when young, they closely resemble the pycnidia of *P. exigua*. It is suggested that *R. mammiformis* is possibly the ascospore state of *Phoma*. Attempts to induce foot rot by inoculation with *R. mammiformis* were successful in one case only. The disease can be controlled by using healthy seed, by growing recognized varieties, and by good cultural practices.

Ocfemia (G. O.). **The rapid dissemination of the mosaic disease of Abacá, or Manila Hemp plant (Musa textilis Née), in the field.**—*Philipp. Agric.*, 33, 2, pp. 142–144, 1949.

In 1941 Japanese planters of *Musa textilis* estimated that half the crops in the eastern part of Davao Province, Mindanao, Philippine Islands, were infected by mosaic due to a strain of *Marmor cucumeris* [cucumber mosaic virus: *R.A.M.*, 29, p. 316]. Since the liberation in 1945, reports of the devastation caused by the disease have ranged from 90 per cent. in some plantings to almost total loss in others.

The results of experimental transmission tests showed that at least four species of aphids are concerned. Thus, *Aphis gossypii* can transmit the virus from diseased to healthy *M. textilis* plants, from *Canna indica* to *M. textilis*, *C. edulis*, and ornamental *Canna* varieties [ibid., 27, p. 364], and from maize to maize; *Rhopalosiphum nymphaeae* and *R. prunifoliae* from *M. textilis* to the same host; and *A. maidis* from maize to *M. textilis* and reciprocally and from *C. indica* to *M. textilis*. It is evident, therefore, that the presence of *C. indica* and graminaceous weeds should not be tolerated in or near *M. textilis* plantings, neither should maize be planted in their vicinity. However, the principal means of spread of the virus from one field or area to another is the use of suckers from stools in the incipient stages of mosaic.

Basu (S. N.) & Ghose (S. N.). **Fungi growing on Jute.**—*J. sci. industr. Res., New Delhi*, 9B, 6, pp. 151–156, 1950.

At the Indian Jute Mills Association Research Institute, Calcutta, 27 species of fungi were isolated from raw jute, yarn, and hessian samples incubated in the shade at 100 to 80 per cent. relative humidity [*R.A.M.*, 28, p. 23]. *Penicillium citrinum* was the predominant species, occurring in 128 out of 240 platings at 100, 95, and 90 per cent. relative humidity. Other species included the groups represented by *Aspergillus terreus* (82 platings), *A. glaucus* (72), *A. flavus-oryzae* (66), and *A. fumigatus* (57), *Paecilomyces varioti* (77), *Chaetomium indicum* (56) [ibid., 29, p. 474], and 87 unidentified Phycomycetes. Mould growth was most prevalent at 100 per cent. relative humidity and gradually declined, only a few species making very slow growth at 85 and 80. Previous observations as to inhibition of the dark-coloured Dematiaceae by other species in the shade were supported by the data obtained in these experiments. In some instances competition seems to play a prominent part, *A. glaucus* and *C. indicum*, for instance, being much more frequently encountered at the lower humidity ranges when dominant species like *Penicillium citrinum* are suppressed.

Neergaard (P.). **Mycological notes. III. 7. Colletotrichum godetiae Neerg. 8. Phoma bellidis Neerg. 9. Zygosporium parasiticum (Grove) Bunting & Mason. 10. Peronospora dianthicola Barthelet.**—*Friesia*, 4, 1–2, pp. 72–80, 1 fig., 1950.

Latin diagnoses are given of *Colletotrichum godetiae*, a fairly common parasite of *Godetia hybrida* in Denmark [*R.A.M.*, 25, p. 382], and of *Phoma bellidis*, frequently encountered on seeds of *Bellis perennis* grown in Denmark, Holland, England, Italy, and Switzerland. The latter species is characterized by densely aggregated, subglobose or globose to lenticular pycnidia, 160 to 220 μ in diameter, and hyaline, cylindrical, ovoid or ellipsoid, non-guttulate conidia, 4·5 to

6 by 1·5 to 3 μ. A fungus tentatively identified as *Peronospora dianthicola* was isolated from Triumph carnation [ibid., 26, p. 301] seedlings from a Jutland garden.

Smith (K. M.). **Some new virus diseases of ornamental plants.**—*J.R. hort. Soc.*, 75, 9, pp. 350–353, 3 pl., 1950.

Lily ring spot virus disease was observed on a large number of hybrid lilies received in Great Britain from the United States. The leaves showed a faint mottling which later disappeared; the plants otherwise appeared normal. Inoculations with the virus induced characteristic symptoms in tobacco and *Nicotiana glutinosa* consisting of concentric rings with a central spot, ring and line patterns, and in the latter host yellow-veined mosaic. Preliminary tests suggest that the virus may not be a cucumber mosaic virus [*R.A.M.*, 17, p. 585; 18, p. 317], as it gave no protection against a special 'white' strain of this virus. *Myzus persicae* transmitted the virus after a short period of feeding. The reactions of *Lilium tigrinum* and *L. regale* demonstrated the potential importance of the virus in Great Britain. Ten days after inoculation dark, ring-like markings developed on the leaves; they turned rapidly into necrotic areas, and spread throughout the plant. The growing point was killed, no flowers were formed, and the whole plant was stunted and deformed. *L. tigrinum* plants are sometimes killed outright, but *L. regale* may partially recover, although no flowers are produced. One of the lilies in the consignment contained a slightly different virus of the ring spot type, which produced no visible symptoms on the American lily and does not appear to infect *N. glutinosa*.

A new virus disease of tulips, tentatively called white streak, produces a number of parallel, longitudinal, white stripes on the leaves. The plants are stunted, with small and degenerate flowers. Inoculations produced very large, circular necrotic lesions in tobacco and *N. glutinosa*, which gradually increased in size. No mosaic mottling was observed. Usually the virus remained confined to the inoculated leaves, but in tobacco it may travel along the petiole and enter the stem, producing a necrotic lesion. The xylem apparently is not attacked and the plant continues to grow. In *N. glutinosa* the virus sometimes spreads through the whole plant, killing the tissues. Such plants ultimately die. Tests with *M. persicae* have given negative results so far. The virus remains infective in extracted juice for four days or longer.

Another unknown virus was isolated from a tulip with numerous dead patches on the leaves. On *N. glutinosa* it produced small circular lesions, and on French bean [*Phaseolus vulgaris*] numerous small, reddish ones, which later turn paler. They do not spread and this differentiates them from the lesions caused by the tobacco necrosis virus, which is now commonly found in tulips [ibid., 28, p. 290].

In 1949 a second virus disease was observed on *Tropaeolum majus* [ibid., 29, p. 198] grown from seed of the previous year's crop. The leaves had a brighter mosaic mottling, with less distortion of the plant. The flowers showed a distinctive colour break. Reactions of various test plants differed from those induced by the first virus. The virus was transmitted by *M. persicae*.

Another presumably undescribed virus was found infecting some *Phlox paniculata* plants in a garden in Cambridge. There was little mottling, but the leaves were badly distorted and the lamina sometimes reduced to mere strings. In tobacco the virus produced a faint ring and line mottling, but in *N. glutinosa* severe distortion developed together with large patches of dead cells. Such plants were frequently killed outright. Attempts to infect cucumber failed.

A virus isolated for the first time from a species of *Buddleia* caused typical mosaic mottling of the leaves with some crinkling and distortion. Inoculation to tobacco produced dark and light mottling without any ring spots. No infection developed in *N. glutinosa* or cucumber. The last two viruses require further study.

Streets (R. B.). **Control of Arizona Rose diseases.**—*Bull. Ariz. agric. Exp. Sta.* 213, 32 pp., 6 pl., 1948. [Received August, 1950.]

This revision of bulletin 190 [*R.A.M.*, 23, p. 179] includes considerable new information especially regarding rose varieties adapted to the Arizona climate. Notes are also given on foliage defects, blossom blights (non-parasitic), and various other causes of failure.

Dimock (A. W.). **Semesan drench for Rhizoctonia control.**—*Bull. N.Y. St. Flower Grs* 60, pp. 6–7, 1950.

In laboratory experiments carried out in the Department of Plant Pathology, Cornell University, two treatments with semesan, applied as a drench at the rate of 1 or 2 lb. per 100 gals. water, controlled almost completely the spread of *Rhizoctonia* [*Corticium*] *solani* in aseptically grown *Matthiola incana* seedlings [*R.A.M.*, 22, p. 163], the percentage of plants dead after 21 days being 3·1 against 54 and 58·4 in the untreated controls.

During the past year the progress of the disease in commercial ranges of *Matthiola*, carnation, *Kalanchoe*, *Begonia*, and snapdragon [*Antirrhinum*] seedlings has been completely checked by treatment with semesan suspension. Moreover many plants which were only lightly infected produced new roots above the diseased tissue and recovered completely. At present the use of semesan is recommended only in cases where infection is established. All obviously infected plants should be removed and an area about 2 ft. greater in diameter than the infected spot should be drenched with semesan at the above rates using $\frac{1}{2}$ to 1 pt. per sq. ft. A second treatment may be made seven to ten days later. This material is not recommended for roses or for plants in a house in which roses are growing.

Baker (K. F.), Snyder (W. C.), & Davis (Lily H.). **Ramularia leaf spots of Lathyrus odoratus and L. latifolius.**—*Mycologia*, 42, 3, pp. 403–422, 1950.

In this paper a leaf spot which has been reported on nine species of *Lathyrus* and was first collected in California in 1933 on sweet pea and in 1938 on *C. latifolius* is designated *Ramularia deusta* n.comb. All other names assigned to this fungus, including the white mould of sweet pea *Cladosporium* [*Hyalodendron*] *album* [*R.A.M.*, 27, p. 237] and those in the genera *Scolecotrichum*, *Ovularia*, and *Ramularia*, are regarded as synonyms. *Erostrotheca multiformis* is considered a nomen ambiguum until evidence is presented of the genetical connexion between this state and the *Ramularia*. The physiologic forms occurring on sweet pea and everlasting pea are named *R. deusta* f. *odorati* n.f. and *R. deusta* f. *latifolii* n.f.

Terrier (C.). **La 'tacheture' des fleurs d'Azalées provoqueé par le champignon Ovulinia azaleae Weiss ; la présence de cette maladie en Suisse.** [The 'spotting' of Azalea flowers induced by the fungus *Ovulinia azaleae* Weiss; the presence of this disease in Switzerland.]—*Rev. hort. suisse*, 23, 3, pp. 79–84, 6 figs., 1950.

In connexion with the discovery of flower spot (*Ovulinia azaleae*) on glasshouse azaleas [*Rhododendron*] [*R.A.M.*, 29, p. 510] in a Lausanne nursery, the writer summarizes the results of American studies on the disease. This is believed to be the first record of the occurrence of *O. azaleae* in Europe. It was introduced into Switzerland on material imported from Belgium in 1948.

Laskaris (T.). **The Diplodina disease of Delphinium.**—*Phytopathology*, 40, 7, pp. 615–626, 3 figs., 1950.

Diplodina delphinii n.sp., the agent of crown and root rot, black leaf spot, petiole rot, and stem canker of *Delphinium* in Connecticut, New York, and New

Jersey [*R.A.M.*, 27, p. 477], is characterized on the host by gregarious, often concentrically disposed, subepidermal, globose, light to dark brown, uni- to triostiolate pycnidia, 120 to 270 μ in diameter (average 175 μ). On culture media the pycnidia are spherical to oval, dark brown to black, furnished with one to four ostioles, and measure 110 to 175 (120) μ in diameter. In nature the dimensions of the hyaline, straight or slightly curved, non- to tri- (mostly uni-) septate spores are as follows: non-septate 6·6 to 14·8 by 3·3 to 4 (9·8 by 3·5) μ; uniseptate 9·9 to 19·8 by 3·3 to 4·1 (14·7 by 3·7) μ; biseptate 14·8 to 19·8 by 3·3 to 4 (17·1 by 3·8) μ. In culture they are hyaline, oval to ellipsoid, biguttulate, consistently unicellular, 3·2 to 6·8 by 1·3 to 2·6 (4·3 by 1·6) μ. The thick-walled, dark brown, sometimes intercalary and concatenate chlamydospores are 13·2 to 29·7 (18) μ in diameter.

The foliar symptoms induced by *D. delphinii* are indistinguishable in many respects from those attributed to *Phytomonas* [*Pseudomonas*] *delphinii* [ibid., 4, p. 480; 27, p. 477, *et passim*]. Tarry black lesions of irregular size and shape are found on the upper leaf surface and light brown ones on the under side. The crown and root symptoms are similar to those caused by other crown rot organisms, except that the vascular tissues invaded by *D. delphinii* are black or dark brown instead of brown, as in the case of *Rhizoctonia* [*Corticium*] *solani* or *Fusarium* [*oxysporum* f. *delphinii*: ibid., 29, p. 305].

At the New York Botanical Garden *Delphinium elatum* and many of the commercial hybrid varieties were naturally infected by *Diplodina delphinii*, which was isolated from the stems of *Delphinium zalil* and the stems and decaying crowns of Ruy's Pink Sensation (*D. nudicaule* × *D. elatum*), *D. tatsiense* × *D. elatum*, and *D. cultorum* var. Belladonna × *D. elatum*. The disease is particularly prevalent on plants weakened by excessive feeding with commercial fertilizers and kept in an extremely humid atmosphere. Greenhouse and field inoculation experiments gave positive results.

Beaumont (A.). **Diseases of China Asters.**—*Gdnrs' Chron.*, Ser. 3, 128, 3325, pp. 140–141, 1950.

China asters are attacked in England by various fungi, infection falling into three phases, damping-off, foot rot (or black leg), and wilt. Damping-off is usually caused by the foot-rot fungus *Phytophthora cryptogea* [*R.A.M.*, 17, p. 181; 23, p. 390], but may be due to *Botrytis cinerea* or to *Rhizoctonia* [*Corticium*] *solani* [ibid., 12, p. 175; 27, p. 511]. If plants affected by foot rot are not too far decayed *P. cryptogea* readily develops when they are kept in a little water in a dish, but very often secondary species of *Fusarium* develop and the condition may be confused with wilt, caused by *F. conglutinans* var. *callistephi* [ibid., 29, p. 145]. This fungus also invades the plant from the soil, but is favoured by warm conditions. Aster wilt may also be caused by *Verticillium albo-atrum* [ibid., 14, p. 447; 18, p. 783; 20, p. 118]; black areas appear on the stem bases and spread upwards, sometimes to the flower stalks, the plants then wilting from below upwards. The roots are not seriously affected, and the stem and branches remain erect, though the leaves may turn yellow and wilt. The vascular tissues become brown and the fungus can be isolated from them.

Improved soil drainage often reduces foot rot, but has no effect on wilt. For both diseases soil disinfection is recommended, steam sterilization being the most effective method. Formalin treatment not less than 15 days before sowing is the best method to use on a small scale (1 gal. per 49 gals. water for 10 to 12 sq. yds.). Cheshunt compounds may be used against black leg. American varieties resistant to wilt [ibid., 14, p. 447; 17, p. 247; 19, p. 8; 23, p. 489] have maintained their resistance in Great Britain.

China asters affected by tomato spotted wilt virus [ibid., 18, p. 65] show dark green mottling or streaking of the leaves, while on the same host cucumber mosaic

virus [ibid., 18, p. 803; 19, p. 61] produces yellowish, mottled leaves; in both cases the flowers are small and malformed. The only control method known is the prompt destruction of affected plants.

Příhoda (A.). **Phoma atro-cincta Sacc. na Ficus elastica Roxb.** [*Phoma atro-cincta* Sacc. on *Ficus elastica* Roxb.]—*Ochr. Rost.*, 22, 3–4, pp. 158–160, 7 figs., 1949.

The dead leaves of *Ficus elastica*, one of the most popular decorative indoor plants in Czechoslovakia, are sometimes attacked by *Phoma atro-cincta*. Round, irregular, yellowish spots appear on the leaves before they fall off, and later the whole leaf turns yellow. When the fallen leaves are kept under high humidity the leaf turns brown and the yellow spots become grey to black, and are covered with black, hemispherical, or conical pycnidia, measuring 180 to 210 μ in diameter. The colourless spores, 5 by 2·5 μ, are mostly elliptical, sometimes with spindle-like ends, sometimes slightly bent. The tissue of the lesions is penetrated by dense mycelial threads. It is suggested that the mycelium of *P. atro-cincta* is parasitic on the living leaves, the pycnidia appearing only when they are dead.

Malan (C. E.). **Sopra un seccume di origine fungina delle foglie di Yucca gloriosa L.** [On a withering of fungal origin of the leaves of *Yucca gloriosa* L.]—Reprinted from *Ann. Accad. Agric. Torino, 1946–1947*, 89, 27 pl., 10 figs., [? 1947. English summary. Received July, 1950.]

In 1939 a disease of *Yucca gloriosa* was widely prevalent in Piedmont. Brown spots appeared on the leaves and became confluent, the lower leaves curving downwards. The condition was favoured by prolonged wet weather and excessive shade, plants growing under good conditions of light, temperature, and humidity developing infection only on a few very old leaves and being unaffected by the disease if these were promptly removed. The disease is widespread in north Italy; it has previously been confused with that caused by *Coniothyrium concentricum* [*R.A.M.*, 5, p. 302], which is often found on the same plant or even the same leaf as the parasite described here.

On the affected parts was a fungus producing from a stroma clavate, later cylindrical, filiform, conidia at first hyaline, finally yellowish or dark, rounded at the ends, and measuring 44 to 55 by 4·5 to 5 μ when 3- to 4-septate and 60 to 85 by 4·5 to 5 μ when 5– to 6–septate. The minute, globose pycnidia, 50 to 60 μ in diameter, scarcely immersed in the stroma, bore a short, papillate ostiole. The continuous, hyaline, obtuse pycnidiospores measured 3 to 4 by 1 to 1·5 μ. The globose perithecia, usually in pairs or sometimes singly or in groups of five or six in the stroma, were 80 to 110 μ in diameter. The deep olive brown excipulum was 15 to 20 μ thick; the cylindrical-clavate, subpedicillate, 8-spored asci measured 60 to 90 by 9 to 12 μ, and the hyaline, oblong-fusiform 4-guttulate, median-septate ascospores 18 to 28 by 4 to 6 μ.

The fungus is regarded as identical with *Diaporthe gloriosa*, hitherto considered to be only saprophytic. The conidial state is *Cylindrosporium yuccae*. The pycnidial state is tentatively described as ? *Ceuthospora gloriosa* n.sp. and a Latin diagnosis of the various states of the fungus is given. Starting with pure cultures the disease was reproduced in all its stages on healthy leaves of *Y. gloriosa*. Control measures recommended are the removal of infected leaves and spraying with a copper mixture.

Dawson (J. E.) & Musgrave (R. B.). **Effect of moisture potential on occurrence of mold in hay.**—*Agron. J.*, 42, 6, pp. 276–281, 5 graphs, 1950.

At the Cornell Agricultural Experiment Station, New York, lucerne, timothy [*Phleum pratense*], red clover, and *Lotus corniculatus* hays were inoculated with

a mixture of [unspecified] mould spores capable of growth on these substrata in equilibrium with air of 85 per cent. relative humidity. The rate of spore application was 0·05 per cent. of the dry hay weight. The time required for a loss of 10 lb. hay from 1 ton, due to mould respiration, was taken as the period necessary for mould development in rehydrated hays and was measured as a function of moisture potential [cf. *R.A.M.*, 27, p. 825]. All times were measured starting with oven-dry (at 70° C.), bloom-stage lucerne.

Five conclusions were drawn from the resultant data. (1) The moisture potential or relative humidity low enough to prevent the development of mould in hays during a given period is approximately the same for all samples. (2) The moisture potential or relative humidity low enough to prevent mould development decreases with increasing length of storage. Hay at 25° with a moisture potential less than $4{\cdot}9 \times 10$ ergs per gm. moisture, or hay in equilibrium with an atmosphere of less than 70 per cent. relative humidity, can be stored free of mould for 200 days. (3) On the other hand, the moisture percentage sufficiently low to prevent mould development in hays during a given period is not the same for all samples. The reason for this is that the percentage of moisture in hay at a given moisture potential is a property of the nature and history of the particular material used. (4) Differences obtained in the time required for the occurrence of fungal spoilage in different hays at a given moisture potential should not be considered as inherent properties unless the organism population and activity is initially uniform for all samples. (5) Non-respiring or slowly respiring and abundant mould populations, which could suddenly be caused to respire by rehydration, were established in lucerne by dehydration to equilibrium with air of 51, 65, and 75 per cent. relative humidity, and such populations were detected in several air-dry samples.

Ekstrand (H.). **Skadorna på de övervintrande grödorna vintern 1948–49.** [Damage to the overwintering crops in the winter of 1948–49.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1950*, 1, pp. 6–11, 1950.

In general, cereals and grasses sustained little fungal damage in Sweden during the mild winter of 1948–9 [cf. *R.A.M.*, 28, p. 279], but *Sclerotinia borealis* and *Typhula borealis* were observed here and there in northern districts on timothy [*Phleum pratense*], the former also attacking rye and the latter meadow fescue [*Festuca pratensis*]. The occurrence of *S. borealis* on grasses in Finland was likewise confined to the northernmost areas, according to a verbal communication from E. A. Jamalainen [see next abstract].

Clover rot [*S. trifoliorum*] was troublesome in a number of places in the south [ibid., 29, p. 249]. At the State Experiment Station at Flahult the Norrland Offer selection showed the highest degree of resistance, while the performance of Svalövs Merkur and more especially of Weibulls Resistenta was very poor. In one locality of Gothland the pathogen destroyed 15 per cent. of the clover and hop medick [*Medicago lupulina*: ibid., 27, pp. 283, 480] stands.

Jamalainen (E. A.). **Overwintering of Gramineae-plants and parasitic fungi. I. Sclerotinia borealis Bubák & Vleugel.**—*Maataloust. Aikakausk.*, 21, 4, pp. 125–140, 5 figs., 1949. [Received November, 1950.]

Sclerotinia borealis [*R.A.M.*, 26, p. 10; 29, p. 9] causes considerable damage to overwintering cereals and pasture crops in the central and northern parts of Sweden [see preceding abstract] and Finland. In Sweden the pathogen occurs commonly in Norrland, particularly in the Norrbotten area, its southern limit being the 61° N. In Finland the fungus is more or less general in the provinces of Lapland, Oulu, Kuopio, and Mikkeli. Weather conditions prevailing during autumn, winter, and spring are of major importance in the incidence and spread of *S. borealis*. The development of apothecia and the dissemination of ascospores

are favoured by long, rainy autumns, and injury is increased by slight freezing of the soil, a thick snow cover, and slow melting of snow in the spring [ibid., 25, p. 496]. The hosts include *Agrostis canina*, *A. stolonifera*, *A. tenuis*, *Alopecurus pratensis*, *Anthoxanthum odoratum*, *Bromus inermis*, *Lolium perenne*, *Poa annua*, *P. pratensis*, *P. serotina*, and *P. trivialis*.

Different varieties of winter cereals and species and strains of grasses vary greatly in their resistance to *S. borealis*. The Finnish winter rye varieties Oiva, Toivo, and Ensi are resistant, especially the latter, which was found to be almost free from infection and only slightly damaged when grown as midsummer rye.

In an experiment carried out in 1948 by the Department of Plant Pathology at the Perä-Polijola Experiment Station, Apukka, Finland, the Swedish timothy grass (*Phleum pratense*) variety Bottnia was highly resistant to the disease, and the Finnish strains Lappi and Tarmo were fairly resistant with 1, 2·5, and 6 per cent. infection, respectively. Plants from North American seed were severely attacked. The Finnish strain of *Festuca rubra* was only slightly infected (2 per cent.), whereas 20 per cent. of the plants of the Swedish strain were injured. *Alopecurus pratensis*, *Anthoxanthum odoratum*, *Agrostis canina*, and *A. stolonifera* were fairly resistant (5 to 6 per cent.), while *A. tenuis*, *Poa pratensis*, and *F. pratensis* were either free from infection or only slightly diseased. The grass strains and winter rye varieties grown in the north are generally more resistant, an important factor in the breeding programme.

Gates (C. M.). **A mosaic and little leaf disease of Crotalaria spectabilis in south Florida.**—*Plant Dis. Reptr*, 34, 7, pp. 203–204, 1 fig., 1950. [Multilithed.]

During June, 1949, a mosaic disease accompanied by stunting and chlorosis, small leaves bearing a slightly rugose mosaic, and chlorotic spots ranging from pale green to bright yellow, was observed in a cover crop of *Crotalaria spectabilis* in demonstration plots at the University of Miami. The flowers were normal but fruit set was less heavy than on healthy plants. By mid-July the mosaic had spread through all the plots and about 25 per cent. of the plants were affected. Three diseased plants developed from 200 seeds from affected plants and 12 from 200 seeds from healthy plants sown in alternate rows with the former.

About 5 per cent. of the plants in a planting sown in January, 1950, at the University horticultural farm were affected by May. A modified form of the mosaic, designated 'little leaf' disease, characterized by stunting and mottled, chlorotic, heavily rugose leaves, $\frac{1}{2}$ to $\frac{1}{4}$ the normal size, appeared in this planting. In June these plants were flowering poorly and no fruit had set. Attempts to transmit either the mosaic or little leaf mechanically were unsuccessful.

Moore (M. H.). **This brown rot problem.**—*Rep. E. Malling Res. Sta., 1949*, pp. 169–173, 1950.

In this paper, prepared mainly for fruit-growers, the author discusses the general problem of brown rot (*Monilia* [*Sclerotinia*] *fructigena* [*R.A.M.*, 29, p. 313] and *M. cinerea* [*S. laxa*]), more particularly with reference to apples, and summarizes the results of recent experiments on control.

Posnette (A. F.). **Virus diseases of fruit trees.**—*Fruitgrower, 1950*, 2838, pp. 861–862, 7 figs., 1950.

Intensive studies are in progress at the East Malling Research Station on fruit virus diseases see above, p. 14, and growers can assist in estimating their prevalence by reporting any suspicious symptoms they may encounter on their trees. The symptoms of the following are briefly described as an aid to recognition: apple mosaic [*R.A.M.*, 29, p. 513], 'rubbery wood' [loc. cit.], and 'chat fruit' [ibid., 24,

p. 480], the two last-named very common in the Lord Lambourne variety; stony pit and veinbanding of pears, the former apparently on the increase; plum veinbanding and mosaic [cf. ibid., 25, p. 384], the former widespread and the latter very infrequent; and cherry rasp leaf [ibid., 24, p. 324], so far reported only from three orchards, two in Kent and one in Worcestershire, tatter leaf [ibid., 29, p. 416], veinbanding, and ring spot [ibid., 28, p. 464; 29, p. 313]. 'Little cherry' [ibid., 29, p. 266] has not yet been detected in Great Britain, but in view of the rapid spread of this serious disease in Canada, growers should at once notify the Station of any trees producing abnormally small fruit.

VULLINGS (W. P.). **Schurft en de resultaten van de schurftbestrijding in 1949.** [Scab and the results of scab control in 1949.]—*Fruitteelt*, 40, 18, pp. 364–365, 4 figs., 1950.

The exceptionally severe apple scab [*Venturia inaequalis*] epiphytotic of 1949 in Holland is estimated to have resulted in a loss to Limburg growers alone of 1,000,000 gulden. Notwithstanding the help afforded by the spray warning service [*R.A.M.*, 28, p. 220], the practical control of this disease remains a very difficult problem. From an inspection of 51 orchards in the Maastricht district it appears that failure is nearly always attributable to unduly long intervals between treatments. For instance, on 7th April (the first of the 'critical' dates, the others being the 25th and 26th April and 6th May), 10½ days had elapsed since the last application in orchards subsequently suffering heavy infection compared with 6½ where the incidence was low. A serious mistake is to spray early- and late-blooming trees at the same time. This common practice led to the postponement of the first post-blossom treatment due by 6th May, when the late varieties were still in flower.

Thus, in the 'bad' orchards the time between the last pre- and the first post-blossom application was 12 and 8 days longer for early and late varieties, respectively, than in the 'good' ones. In the former, moreover, the last pre-blossom spray was applied too soon to confer adequate protection on the early varieties, which were consequently exposed to attack on the critical days of 25th–26th April. The omission of one treatment at the decisive blooming period cannot be retrieved by three or four summer sprays.

CLULO (GENEVIEVE) & BERG (A.). **Distribution of boron in the tissues of the Apple tree.**—*Proc. W. Va Acad. Sci.*, *1947*, pp. 43–49, 1947. [Received July, 1950.]

Studies at West Virginia University showed no boron deficiency present in apple trees of local orchards examined. In any given age group individual trees differed slightly from one another in the boron content of the tissues. This was always highest in the leaves [cf. *R.A.M.*, 29, p. 262] and declined in all tissues as the season advanced. The boron content of the fruit expressed as a percentage of dry matter decreased as the fruit developed. The available boron in the soil varied with the orchard. Boron added to the soil dry or in solution was readily taken up by one- and two-year-old trees.

Apple trees grown in sand culture in the greenhouse with 2 p.p.m. of boron added appeared normal, but those without boron showed boron deficiency symptoms the first season, these symptoms being apparently unrelated to internal bark necrosis [ibid., 29, p. 33]. These trees were stunted and the branches drooped. In the second season the branches grew horizontally, with shortened internodes, while in the third rosetting of the leaves near the tip of the stems was present. Four growing seasons were required to reduce the boron content of the wood of the current season's growth to a point where none was detectable.

PADFIELD (C. A. S.). **The effect of rootstocks and intermediate scion varieties on the cool-storage disorder, core-flush, in Granny Smith Apples.**—*N.Z.J. Sci. Tech.*, A, 30, 5, pp. 271–275, 1949. [Received July, 1950.]

Core flush is a major disorder of Granny Smith apples in cool store in New Zealand [*R.A.M.*, 26, p. 229]. The varieties Dunn's Seedling, Granny Smith, and Statesman are particularly susceptible, while it is found to a lesser extent in Cox's Orange, Delicious, Jonathan, and Sturmer Pippin. Incidence was high in all samples from many combinations of rootstock stored at 34° F. for periods from 192 to 215 days in 1944 and 1945. In the Hastings district 20 to 62 per cent. were moderately or severely damaged and 36 to 94 per cent. in the Nelson district. In 1946 core flush in Granny Smith apples on Northern Spy and Malling rootstocks varied from 24 to 63 per cent.

The flesh between the seed cavities turns reddish-brown, but in extreme cases affected tissue becomes desiccated, and cracking within the core zone sometimes occurs, especially in immature fruits and where fruits are held below the recommended temperature.

Under commercial conditions differences in degree of core flush can be expected between different orchards in any one season and from the same tree in successive seasons. Different rootstocks and intermediate scion varieties had no consistent effect on the incidence of the disorder. In re-working existing trees with Granny Smith there is no need to consider the effect of intermediate variety on core-flush in future crops.

ANGELL (H. R.). **Observations on brown rot of stone fruits in four successive seasons in four Canberra suburbs.**—*J. Aust. Inst. agric. Sci.*, 15, 3–4, pp. 159–160, 1949. [Received June, 1950.]

During the seasons from 1946 to 1948 the incidence of brown rot (*Sclerotinia fructicola*) [*R.A.M.*, 25, p. 347; 27, p. 246, and next abstract] in Canberra was seen to differ in adjacent trees. Apricots, peaches, or nectarines with 5 to 95 per cent. infection were sometimes within 30 yds. of each other. The incidence also differed from year to year and was found to be independent of weather and amount of inoculum and must be influenced by the physiological status of the trees, depending largely on local soil environments. An experimental plot has been established to test the effect of soil management on brown rot.

ANGELL (H. R.). **Some instances of great variability in incidence of brown rot of stone fruits in Canberra in 1949–50.**—*J. Aust. Inst. agric. Sci.*, 16, 1, pp. 33–34, 1950.

In further work in December, 1949, on the incidence of brown rot (*Sclerotinia fructigena*) [*S. fructicola*: *R.A.M.*, 29, p. 313, and preceding abstract] of stone fruits in Canberra, the author placed test tubes containing the sporulating fungus on branches of an apricot tree with green fruits, some of which were infected with brown rot. The loss from brown rot was less than 1 per cent., while on another tree, about 100 yds. away, the loss was more than 66 per cent. To aid in the 'building up' of inoculum in the former tree, mummied fruits were left for three seasons both on the ground and on the twigs of this and neighbouring trees, but there seemed to be no correlation between disease incidence and this means of increasing inoculum. Similar variability in the incidence of the disease was observed on adjacent peach trees, one having no loss and the other total fruit loss from brown rot. The infection rates for two Mayflower peach trees from the same stock were 50 per cent. for the older tree and 10 per cent. for the younger, and two years previously under unusually wet conditions the corresponding losses were 100 and 7 per cent. respectively. During the season under review nectarines suffered the

greatest damage, and there were only two small areas in which a high percentage of the fruits was free from infection. In one, four trees within 50 yds. of each other suffered less than 10 per cent. losses, while the loss from a tree in the vicinity exceeded 95 per cent.

It is concluded that the prevailing weather cannot be the main factor conditioning brown rot on the observed trees, and that the incidence of disease does not appear to be related to attempts to 'build up' inoculum. Susceptibility to brown rot in peach trees from the same stock does not seem to be inherent, but induced by conditions peculiar to the immediate environment of the tree.

MARSHALL (G. E.). **Interrelation of Peach insects and disease control at Orleans, Indiana.**—*J. econ. Ent.*, 42, 5, pp. 806–810, 1949.

Peach brown rot [*Sclerotinia fructicola*: *R.A.M.*, 29, p. 417] has long been known to flourish under conditions favouring heavy insect infestation, and in the writer's experiments in Indiana effective control of the plum curculio [*Conotrachelus nenuphar*] and oriental fruit moth [*Cydia molesta*] automatically reduced the fungal disease to a very minor problem. From his results and those of other workers a schedule comprising chlordan (benzene hexachloride) for the early part of the season or until about mid-July, followed by DDT, appears to be about as satisfactory as any that could be adopted.

MILBRATH (D. G.). **Bacterial spot disease of Peach.**—*Bull. Dep. Agric. Calif.*, 39, 3, pp. 109–113, 4 figs., 1950.

An account is given of bacterial spot disease of peach (*Xanthomonas pruni*) [*R.A.M.*, 29, p. 218], not yet reported from California. It occurs on stone fruits in at least 26 States, Oklahoma and Texas forming the western border. The susceptible hosts include *Prunus salicina*, *P. japonica*, *P. mume*, almond, and *P. davidiana*.

BLUMER (S.). **Viruskrankheiten im Obstbau.** [Virus diseases in fruit culture.]—*Schweiz. Z. Obst- u. Weinb.*, 59, 3, pp. 63–66, 3 figs., 1950.

The 'Pfeffinger' disease of cherries is an example of the virus group of infections, which are more important in Swiss fruit culture than has hitherto been realized. Of late years a few similar diseases have been observed on sweet cherries, but whether they are milder expressions of the same virus, or due to other viruses, is not yet known. Poor shoot growth is a conspicuous feature of such disorders, suggestive of mineral deficiency. Sometimes the leaves bear olive-green to yellow lesions of variable extent.

Not infrequently the leaves are deformed or, as in the 'Pfeffinger' disease, small, narrow, dry, and sharply dentate. Occasionally the epidermis swells on the under side, especially along the veins, forming prominent, dark green spots, or large excrescences project from the leaves. The midrib is often more or less broken up into single strands and the lateral veins pursue an irregular course. The symptoms appear first on one branch, whence they gradually spread over the entire crown. Viruses of this type are transmissible by grafting, a diseased scion (which may appear healthy through masking of the symptoms) infecting a sound stock and vice versa. Transmission by way of the seed has not been established, but the occurrence of symptoms on wild woodland seedlings does point in this direction.

Control measures should include stringent selection in the nursery (also of wild stocks), excluding all suspected material from the market; periodical supervision of the 'mother' trees providing scions, which should never be procured from infested areas; and prompt removal of single infected trees or small virus foci.